ELECTRICAL WEST

MAY 1 1945

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.

MANUFACTURERS' DIRECTORY

APRIL 1945
25c a Copy

MEASURING "SELLING" LIGHT ... ANOTHER EDISON SERVICE

Scientific surveys and the experience of thousands of merchants have proved that good store lighting is necessary to successful selling. When lighting intensity is increased in display windows and interiors, sales also increase. *Goods sell better when customers see better.*

As a service to the merchants in Edison-served territory, the Edison Company maintains a staff of lighting consultants who will make a thorough, accurate check-up of a store's lighting, recommending improvements where needed. There is no charge or obligation.

Shown here are folders recently sent to merchants by the Edison Company offering the "light measuring" service. It is due in part to this service that the stores of Central and Southern California have achieved an unusually high standard of lighting and of successful merchandising.

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

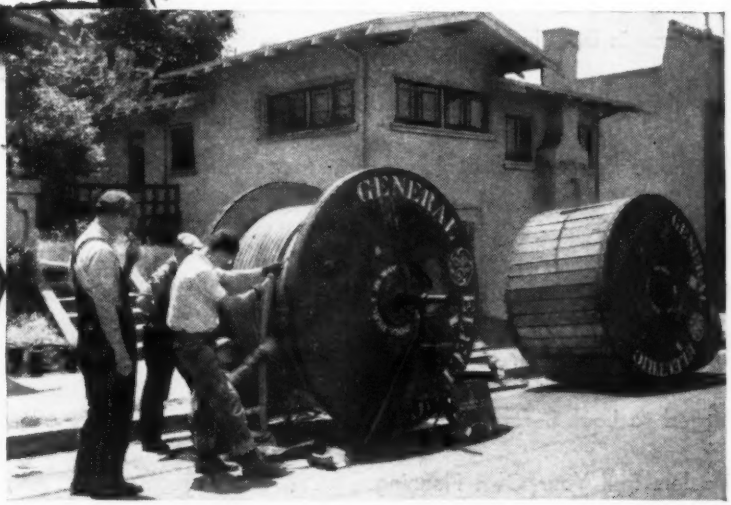
ELECTRICAL WEST (with which is consolidated The Journal of Electricity), April, 1945. Vol. 94, No. 4. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rates—U.S., U.S. Possessions and Latin American Republics: $2, 1 year; $3, 2 years; $4, 3 years. Canada: $2.50, 1 year; $4, 2 years; $5, 3 years. Other countries: $3, 1 year; $5, 2 years; $6, 3 years. Single copy, 25c. Copyright, 1945. McGraw-Hill Company of California.

—low-pressure gas-filled cable for 10 to 40-kv service will be comparable in economy with solid-type insulated cable, with the added advantage of self-supervision

—A.I.E.E. Transactions—1939

G-E STUDIES FORECAST IT

FIELD EXPERIENCE CONFIRMS IT



More than 250,000 feet of gas-filled cable (10 to 40 kv) now operating. More installations planned

EVERY installation of G-E low-pressure gas-filled cable has proved the accuracy of that forecast. Installations considered experimental when made by utilities five years ago are now accepted as setting the pattern for many of their future cable runs. To date, there has been no cable failure, no insulation deterioration. Gas-filled cable and solid-type insulated cable *are* comparable in economy, but gas-filled cable offers not only self-supervision in addition, but other advantages as well.

SELF-SUPERVISING *Plus*

In addition to the self-supervision feature, which guards it against failure following sheath damage, gas-filled cable has the ability to withstand overloads with a greater margin of safety. Ionization is self-extinguishing, even at levels of voltage stress higher than normal working-voltage stresses.

EASY TO INSTALL

With gas-filled cable, profile of the installation is no longer a problem, because there is so little compound migration. Joints can be made with essentially the same technique as for solid-type cable. A simple nitrogen-gas cylinder, equipped with valve and pressure relay, maintains gas pressure in runs up to 40,000 feet.

For further information on low-pressure gas-filled cable, ask for Bulletin GEA-3652. *General Electric Company, Schenectady 5, N. Y.*

RATINGS: Low-pressure, 10 to 40 kv; Medium-pressure, 40 to 69 kv

GAS-FILLED CABLE

GENERAL ELECTRIC

501-26-1200

Buy all the BONDS you can—*and keep all you buy*

ELECTRICAL WEST

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CHANGE OF ADDRESS

Circulation Manager,
Electrical West,
68 Post St.,
San Francisco 4, Calif.

Please change my address

From .....

To .....

Signed .....

People

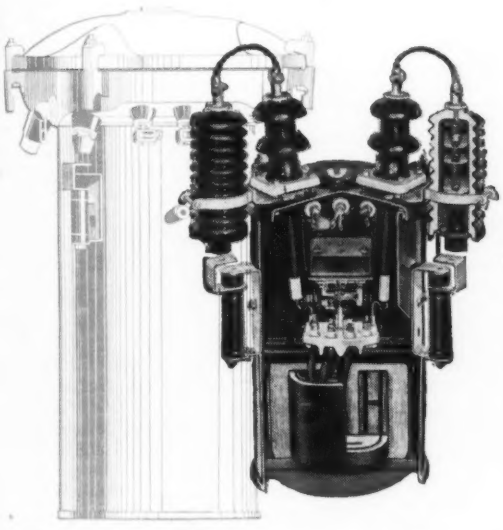
Fred Benz knows rubber and he knows wire, for he has been connected with the wire and cable division of U. S. Rubber Co. since 1922. Born in Pittsfield, Mass., he received his B.S. in mechanical engineering from Worcester Polytechnic Institute, worked vacations at General Electric's Pittsfield plant. He served in the Navy during the last war, joining U. S. Rubber in 1922 as a factory engineer in the wire and cable division. He was sent West in 1925 to head sales in this territory, transferred to Chicago in 1931, and back to the Coast in 1937. He is manager of field activities for his company in the West. He is serving now as chairman of the wiring committee of the Northern California Electrical Bureau.

Frank W. Jordan who presents Practical Aspects of the Heat Pump, p. 65, is a national authority on air conditioning. After being graduated in electrical engineering from the University of Minnesota, he took the Westinghouse Electric & Mfg. Co. graduate student course and then spent two years in the general engineering department at Pittsburgh. He then went to the Butte office of Westinghouse, where he was sales engineer until 1933. Following this he became Pacific Coast supervisor of air conditioning, with headquarters in San Francisco, moving to Los Angeles in 1941 in the same position. He has been in air conditioning since 1933 and has designed a number of important installations.

● To PREVIEW next month's features there will be a water resources forecast from USDA's Ewing; another contribution to the pertinent topic of house heating in the Northwest; a new electronics series on dielectric and induction heating; an unusual lighting and wiring installation at Lockheed; an analysis of the Seattle water heating progress under an all-electric rate.

Will your distribution transformers be safe when this happens at fifty homes on one circuit? They will be safe if they're CSP distribution transformers!

THEY LET YOUR FUTURE LOAD CHANGES PLAN THEMSELVES



The complete lightning protection feature of CSP transformers protects the insulation between the windings, and between either winding and the tank or core. This is accomplished by limiting the potential difference between any two of these points, chiefly by "De-ion" arresters. It is done so effectively, extinguishing the power-follow arc within a half-cycle, that there is not even any light flicker on consumer feeders.

Why try to predict in fine detail, just where your domestic loads will grow? Or when? Or how much?

If you let CSP distribution transformers handle your load, the load itself will notify you safely . . . economically . . . and in plenty of time. Completely Self-Protecting (against dangerous overloads, short circuits and lightning), these Westinghouse transformers can be matched closely to your present load, eliminating idle capacity.

When the load has started to grow, you'll get the warning signal light to tip you off. Or, at the most, the internal breaker will trip. Then, in areas where overload conditions persist, you have but one unit to change—since all the protective apparatus is inside the tank.

For complete information, call your Westinghouse office, or write for Descriptive Data 46-100. Westinghouse Electric & Manufacturing Co., P.O. Box 868, Pittsburgh 30, Pa. J-70439

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

CSP DISTRIBUTION TRANSFORMERS

ON THE JOB

WITH KLEINS

TOOLS KLEIN

This book on the care and safe use of tools will be sent on request.

● Extension of communication lines and power lines—improvements in existing services—are waiting for the men and materials now so vital to complete victory. When that time comes, Kleinmen will be back on the job doing their part to aid the rapid transition from a war to a peacetime economy.

Serving these men will be the sturdy, reliable equipment carrying the name Klein so familiar to linemen and electricians since the first wires were strung nearly a century ago.

Today, Mathias Klein & Sons are producing the equipment they have always made—only more of it. This production will be available to serve peacetime industry as soon as war conditions permit.

KLEIN TOOLS EST. 1857

Since 1857

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons

Established 1857 Chicago, Ill., U.S.A.

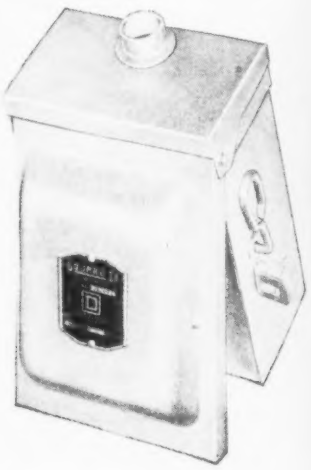
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

PRODUCTS

that are news

Enclosure Hub (400)

A new interchangeable hub has been developed by Square D Co. for its rain-tight safety switch enclosures. The opening in the top end wall of the switch enclosure is closed with a removable cap. When cap is removed on the job, five interchangeable hubs are available, all adaptable to the new Type RO in the Type C and D enclosures. These switches will be provided with one threaded opening in the top end wall of the box. This thread will not take standard fittings and adapter bushings and plugs will be sold as separate items. All switches requiring the use of adapter hubs should be ordered with the suffix RO, the announcement states.



Ceramic Insulation (401)

Electronics Mechanics Inc. has announced that it is making its Mykroy line of ceramic insulation in larger sheets. Formerly the largest size available was 14½ x 19¼ in. The new sheet is 19¼ x 29¾ in. and is made in thicknesses ranging from ⅛ to 1½ in. Bar stock is available now to 29½ in. in length and 1¼ in. in diameter or cross section. According to the manufacturer, the larger size sheets make this insulation available for switchboard panels, large meter panels, transformer covers, switch connecting rods and other uses. The line is a glass bonded mica ceramic insulation.

Circuit Tester (402)

Ideal Commutator Dresser Co. has announced the Lo-Volt Test Glo, for testing circuits from 5 to 50 volts. Similar in design to the company's standard circuit tester, this device is seven inches long, has insulated test leads four inches long. The incandescent glow lamp is protected by a transparent plastic housing.

Washers (403)

Edison General Electric Appliance Co. has announced that automatic washing machines and electric tumbler dryers will be added to the Hotpoint line postwar. These are to be available as soon as manufacturing conditions permit, it was stated.

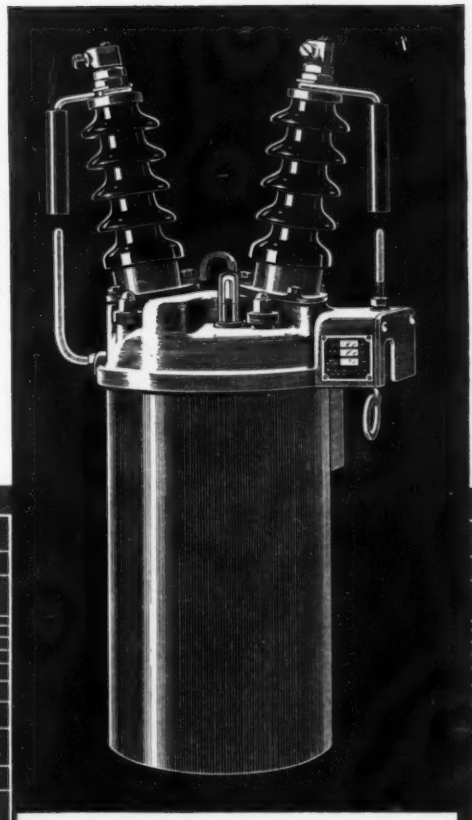
Type "H" KYLE Oil Circuit Reclosers AUTOMATICALLY keep MORE of your lines open MORE of the time

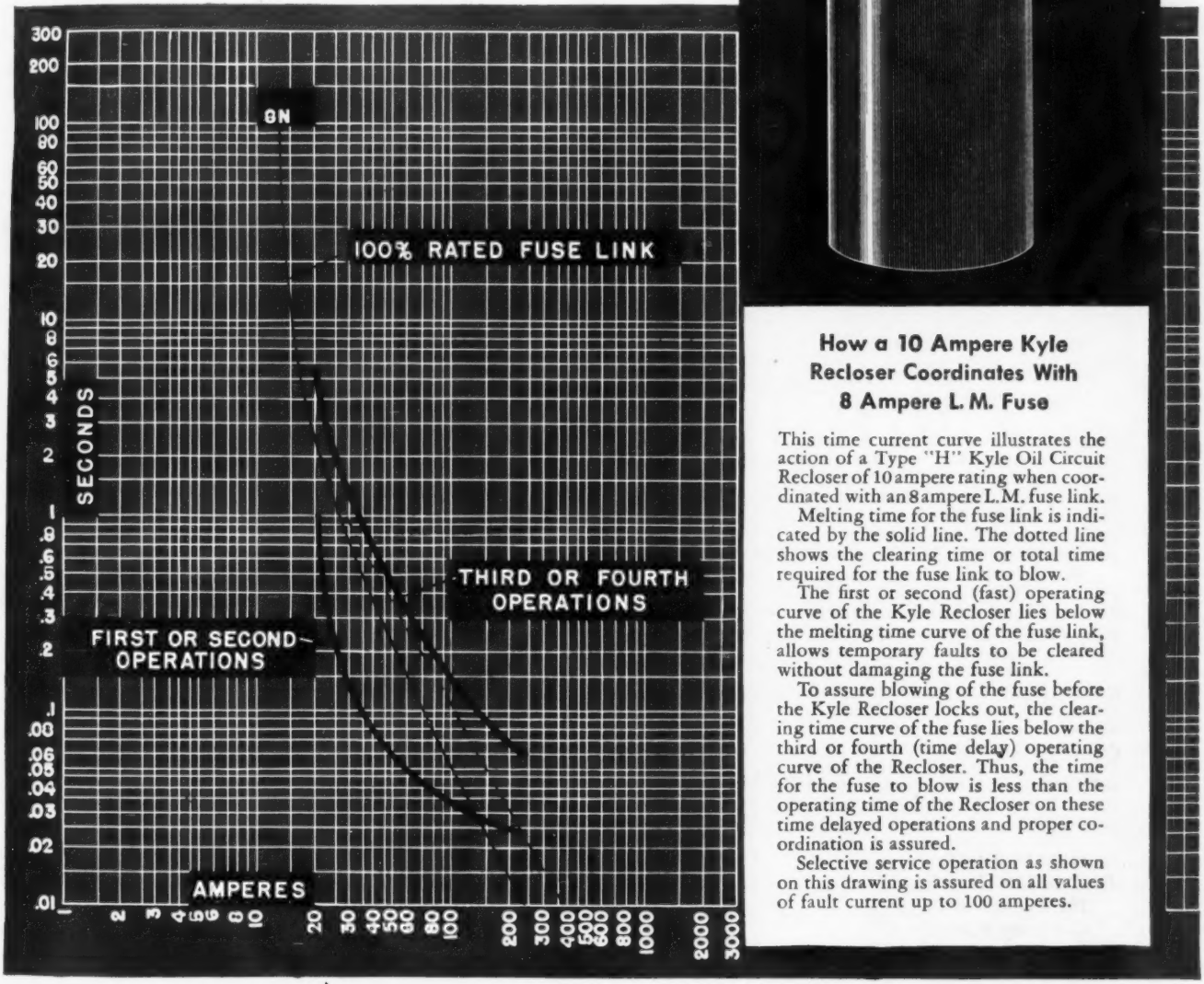
Use of Type "H" Kyle Automatic Oil Circuit Reclosers at strategic points gives greatest possible continuity of service.

Dual operating characteristics of Kyle Reclosers automatically act to protect the fuse links on all short-duration, temporary faults . . . save countless service trips. It is the result of the exclusive Kyle trouble-free hydraulic mechanism which gives:

1. Fast Opening on first and second operations . . . acts before the fuse can blow . . . automatically restores full service if the temporary fault is quickly cleared.

2. Time Delay Opening on third and fourth operations . . . permits the fuse to blow . . . isolates the short section of line that it protects.





How a 10 Ampere Kyle Recloser Coordinates With 8 Ampere L. M. Fuse

This time current curve illustrates the action of a Type "H" Kyle Oil Circuit Recloser of 10 ampere rating when coordinated with an 8 ampere L. M. fuse link.

Melting time for the fuse link is indicated by the solid line. The dotted line shows the clearing time or total time required for the fuse link to blow.

The first or second (fast) operating curve of the Kyle Recloser lies below the melting time curve of the fuse link, allows temporary faults to be cleared without damaging the fuse link.

To assure blowing of the fuse before the Kyle Recloser locks out, the clearing time curve of the fuse lies below the third or fourth (time delay) operating curve of the Recloser. Thus, the time for the fuse to blow is less than the operating time of the Recloser on these time delayed operations and proper coordination is assured.

Selective service operation as shown on this drawing is assured on all values of fault current up to 100 amperes.

Ask your Line Material representative for full information on Type "H" Kyle Automatic Oil Circuit Reclosers. He will be glad to supply time current charts and technical data on how Kyle Reclosers can be used to best advantage on your lines.

MADE BY KYLE CORPORATION SOUTH MILWAUKEE WISCONSIN

4 steps to Better Postwar Commercial Lighting

The prior claims of war production are a necessary limitation on all activities looking to the development of postwar markets. Within those limitations, which all of us recognize, the lighting industry has an obligation to prepare now for its share in the task of stimulating postwar business activity and providing postwar jobs. Commercial lighting will be the spark—hence the program outlined on these pages.

"To make G-E Lamps STAY BRIGHTER LONGER" The constant aim of G-E Lamp Research

1 G-E SPONSORS NEW LIGHTING IDEAS

Several of the nation's outstanding architects and industrial designers have been commissioned by G-E to suggest creative new lighting ideas for postwar commercial establishments. Their ideas are only suggestions but fixture manufacturers already are at work on new designs to put many of these ideas into practical fixtures.

2 G-E PROMOTES NEW LIGHTING MARKETS

G-E Lamp advertising covers practically all your postwar commercial lighting markets – with horizontal coverage in general magazines such as Time, Newsweek, Business Week and U. S. News, and vertical coverage in thirty-nine other publications that reach special fields—everything from banks to beauty shops, and groceries to garages.

3 G-E DEVELOPS NEW LAMPS

New G-E Mazda Fluorescent Lamps will make higher standards of store lighting easier to sell. More than ever before the lighting of the postwar store will say "Come in and Buy!" New G-E Fluorescent Lamps will include both slimmer, longer tubes and circular shapes.

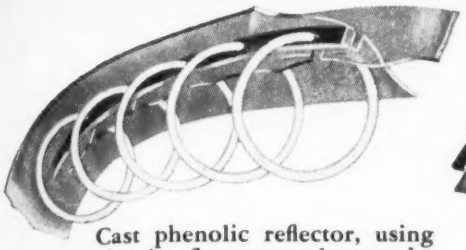
4 G-E SUGGESTS YOU TRY THE NEST EGG PLAN

What the merchant sees in other stores influences his own relighting plans. That fact is the basis of General Electric's "nest egg" plan. By selling and planning a model lighting installation in each shopping area NOW, and by making arrangements for delivery of materials as soon as they are available, you can make sure that the *first* relighting job in each neighborhood will set a high standard for all the rest. Why not try it?

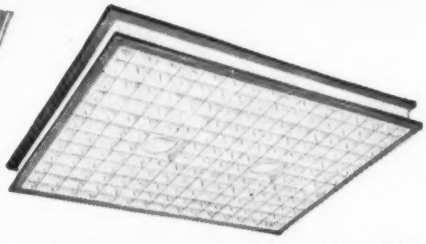
BUY WAR BONDS AND HOLD THEM

G-E MAZDA LAMPS

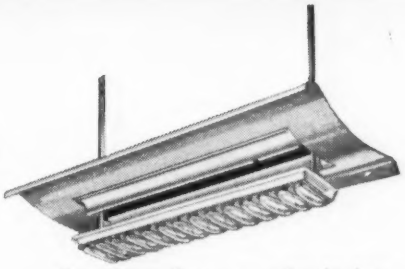
Hear the G-E radio program, "The G-E All-Girl Orchestra", Sundays 10:00 p.m.



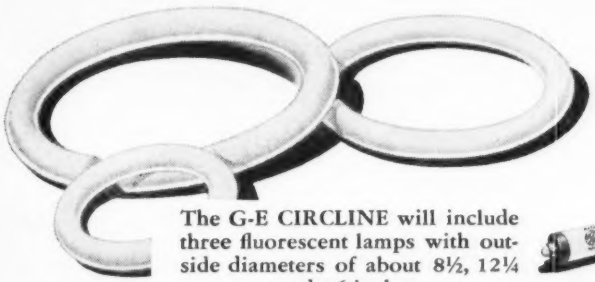
Cast phenolic reflector, using circular fluorescent lamps, designed to direct store traffic.



Fluorescent unit with adjustable spotlights for highlighting displays.



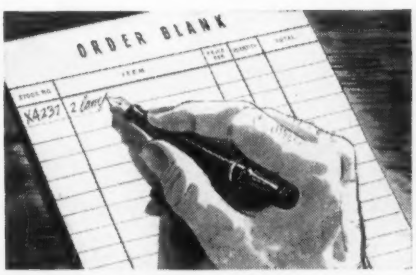
Four-lamp fluorescent luminaire suggested for grocery store.



The G-E CIRCLINE will include three fluorescent lamps with outside diameters of about 8½, 12¼ and 16 inches.

The G-E SLIMLINE—four new slimmer fluorescent lamps up to eight feet in length.

FIRST: Sell the nest eggs NOW. Show the storeowner the advantages of being *first* in his neighborhood to relight and explain how you will help him. Bring a contractor and supplier in on the job.



SECOND: Make a complete layout, covering general, showcase, display and decorative lighting, both incandescent and fluorescent. Order all the materials NOW, for delivery when conditions permit.

THIRD: Expedite the installations. Your nest eggs will get off to a head start—and you'll have in each shopping area a practical example of first-rate lighting that will set the pace for all. Try it!

GENERAL ELECTRIC

EWT, NBC, "The World Today" news, Monday through Friday 6:45 p. m. EWT. CBS, "The G-E Housepower," Monday through Friday 4:00 p. m. EWT, CBS.

Pointing the Way to

HIGHER DIELECTRIC STRENGTH ...LONGER LIFE!

The PRODUCT WITH A PEDIGREE
THE P.D.GEORGE CO.

PEDIGREE
INSULATING VARNISHES

Laboratory-tested . . . proven in service . . . first choice of the entire industry. Pedigree Varnishes are designed to do the job better.. backed by a quarter-century of experience.

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INSULATION & WIRES INCORPORATED
TRI-STATE SUPPLY CORPORATION

Manufactured by

THE P. D. GEORGE COMPANY, ST. LOUIS, U. S. A.

COMPARE REGULATORS

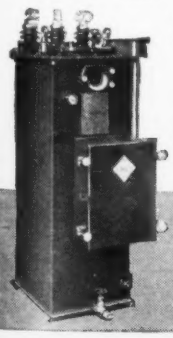
For 2400 v. Distribution Feeders

Features	Induction-Type Regulators	Allis-Chalmers 5/8% Step Regulator
Low Exciting Current?	NO Three times that of Step Regulator.	YES A third that of Induction Regulator.
Quiet Operation?	NO Core slots, rotor bearings, air gap may cause noise.	YES Regulator has no more audio noise than equivalent transformer.
Flexibility of Current Rating?	NO Gives ±10% regulation at rated current and ±5% regulation at double the current value.	YES A-C regulator gives ±10% regulation at rated current, and ±8¾%, 7½%, 6¼% and 5% regulation at higher currents.
Holding Coil Adjustments Eliminated?	NO	YES
Close Regulation?	YES Voltage held within 1% (1 volt). Holding coil adjustments, tendency of motor to overshoot make perfect regulation difficult.	YES Voltage held within ¾ volt by 5/8% step regulation with Feather-Touch control.

YES, YOU SAVE money and you get better regulation by using Allis-Chalmers 5/8% Step Regulators on low voltage single-phase feeders — as shown by the comparison chart above.

Note especially that Step Regulator requires only *one-third* the excitation of induction regulators! Savings which result from reduced exciting current requirements are tabulated at right. "Power Savings" column represents system kva released for revenue-producing loads. Figures in the "Dollar Savings" column stand for the cost of capacitors which would be needed to release this power if induction regulators were used.

Get the full story on the DFR 5/8% Step Regulator in Bulletin B-6065. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.



STEP REGULATOR ECONOMY CHART		
2400 VOLT REGULATOR RATING	POWER SAVINGS	AVERAGE DOLLAR SAVINGS
36 kva	6.1 kva	$ 37
48 kva	8.1 kva	$ 49
60 kva	10.2 kva	$ 61
72 kva	12.2 kva	$ 73
96 kva	16.3 kva	$ 98
120 kva	20.4 kva	$122

A 1824

ALLIS-CHALMERS *5/8% STEP REGULATORS*

♪ *Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.*

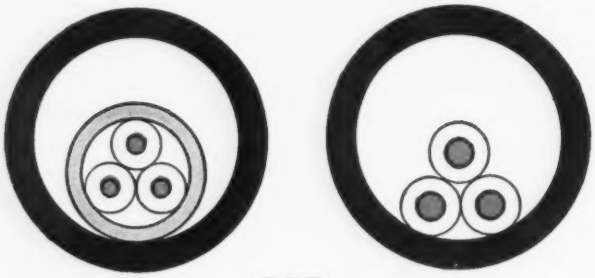
• RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES •

• BUILDING WIRE • SERVICE ENTRANCE CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • ARMORED CABLE •

• PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES •

CRESCENT SYNTHOL TYPE SNW

FOR MORE COPPER IN WET LOCATIONS

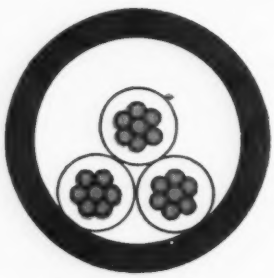


OLD

No. 14/3 Conductor, Type RL
Carries 15 amps.

Three No. 10, Type RW
Carry 25 amps.

For ¾" Conduit



NEW
Three No. 6, Type SNW
Carry 54 amps.

Insulated with a special thermoplastic that is extremely resistant to moisture, acids, alkalies and oil, inherently flame-retarding, high dielectric and mechanical strength, bright, permanent colors, small diameter, easy pulling free stripping

SYNTHOL TYPE SNW

is approved by Underwriters Laboratories in sizes from No. 14 through No. 4/0 AWG under section 3035 of the 1940 N.E. code for use in raceway systems, such as: (a) Underground, (b) In concrete slabs or other masonry in direct contact with the earth, (c) In wet locations, (d) Where the condensation and accumulation of moisture within the raceway is likely to occur.

Write for Descriptive Folder on SYNTHOL Types SNW and SN

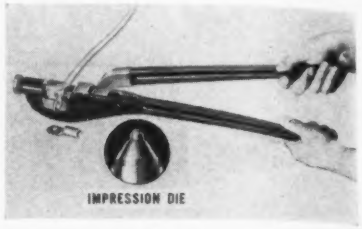
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

Available Through Electrical Wholesalers

• IMPERIAL NEOPRENE JACKETED PORTABLE CABLES •

Hand Tool (404)

A hand tool for installing copper and aluminum electrical connectors has been added to the Burndy line. Known as Hytool MY28, this tool weighs 6½ lb.; was designed for use on connectors for aircraft cable No. 8 to 4/0; U. S. Navy cable, No. 23 to 250



Mcm.; commercial cable, No. 8 to 250 Mcm.; flexible, extra flexible and welding cable No. 8 to 4/0. According to the manufacturer, the new design substitutes a combination of impression die and adjustable holding die for the removable dies formerly required to make correct indentations on barrels of the various sized connectors.

Indicating Device (405)

J-B-T Instruments Inc. is making an electrical indicating instrument which combines frequency meter and elapsed time meter in one case. According to the manufacturer, frequency or speed is indicated to an accuracy of plus or minus 0.3% by a bank of five reeds calibrated in single-cycle steps from 58 to 62 cycles. This meter is available also for 48 and 52 cycles and in half-cycle steps for 59 to 61 cycles and 49 to 51 cycles, with accuracy of plus or minus 0.2%.

The running time meter is driven by a synchronous motor and indicates elapsed time in hours and tenths. The instrument operates on 110 volts.

Panel Instruments (406)

General Electric has added a line of 2½-in. hermetically sealed panel instruments. These instruments are housed in steel cases and are said to be immune from effects of humidity, moisture, chemical fumes and other harmful agents. They are for d-c voltmeters and ammeters and for a-c radio-frequency ammeters and can be furnished in all standard ratings of American War Standard ASA Specification C-39.2-1944.

Rubber Cement (407)

The B. F. Goodrich Co. has a new rubber cement, Plastilock 500, for bonding metals, wood, plastics and ceramic material to themselves or to each other. It is a non-thermosplastic, water and aromatic oil-resistant adhesive. According to the announcement, tests on metal-to-metal bonding have shown a shear strength of 3,250 lb. per sq. in., and tension strengths of 4,000 lb. per sq. in. have been reached.

Trolley (408)

A rubber-insulated trolley, said to be adaptable to almost every type of electrically operated mobile equipment, has been announced by the Benbow Mfg. Co. The new system is designed to operate on single- or multiple-phase a-c or d-c circuits up to 600 volts. A traveling trolley with six-tooth positive contact eliminates flashovers, arcing, pitting and notching of conductor bars, the manufacturer states.

PLAN FOR A BETTER, BIGGER LIGHTING BUSINESS WITH Mitchell

America's Most Complete Line

Play Safe with Your POST-WAR FUTURE . . .

Depend on MITCHELL for all this!

A complete line of lighting units—new ideas—advanced designs—best sellers—volume repeaters. The right kind of unit for every purpose: factories, offices, stores, schools, homes, public buildings. Easier to sell! Surer to satisfy!

- Industrial and Commercial Units
- Fluorescent Desk Lamps
- Strip Lighting
- Slimline and Circline Units
- I. E. S. Floor and Table Lamps
- Fluorescent Kitchen Units
- Bed Lamps
- Infra-Red and Ultra-Violet Health Lamps
- Lullaby and Lumitone Radio Lamps
- Polaroid Lamps
- Spotlight Equipment
- Store Window and Show Case Lighting
- Store Counter Units
- and Other Lighting Specialties

Look at the record. Prior to Pearl Harbor, MITCHELL creations boomed lighting sales and profits to a new peak. Then . . . conforming with wartime restrictions, MITCHELL led in originating new, exclusive designs that helped you meet industry's critical need. At every stage, MITCHELL ingenuity, engineering and resources assured you the *most complete* quality line. A *guaranteed* line. A line that enabled you to render a thorough lighting service to your customers. That's why MITCHELL became first in popularity with those who *buy* . . . as well as those who *sell!*

MITCHELL FLUORESCENT

Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
West Coast Factory and Sales Office:
1019 N. Madison Ave., Los Angeles 27, Cal.

How

● *The automatic stacking machines shown have enabled Sangamo to play an important part in meeting the heavy and exacting requirements of wartime America. Well-trained operators, adequate facilities, and competent supervision have contributed in some measure in helping the United States to become the world's leader in Electronic developments.*

THESE OPERATORS who assemble Sangamo mica capacitors are fully aware of the dependability required in their performance. They know that full quality must be built into these units to meet the high standard set at Sangamo. Skilled operators, utilizing the most modern mechanical equipment, contribute to the excellence of the finished product, be it the smallest or the largest capacitor.

SANGAMO ELECTRIC

ESTABLISHED 1898 • • • MICA CAPACITORS • • •

EXCELLENCE IS BUILT INTO....

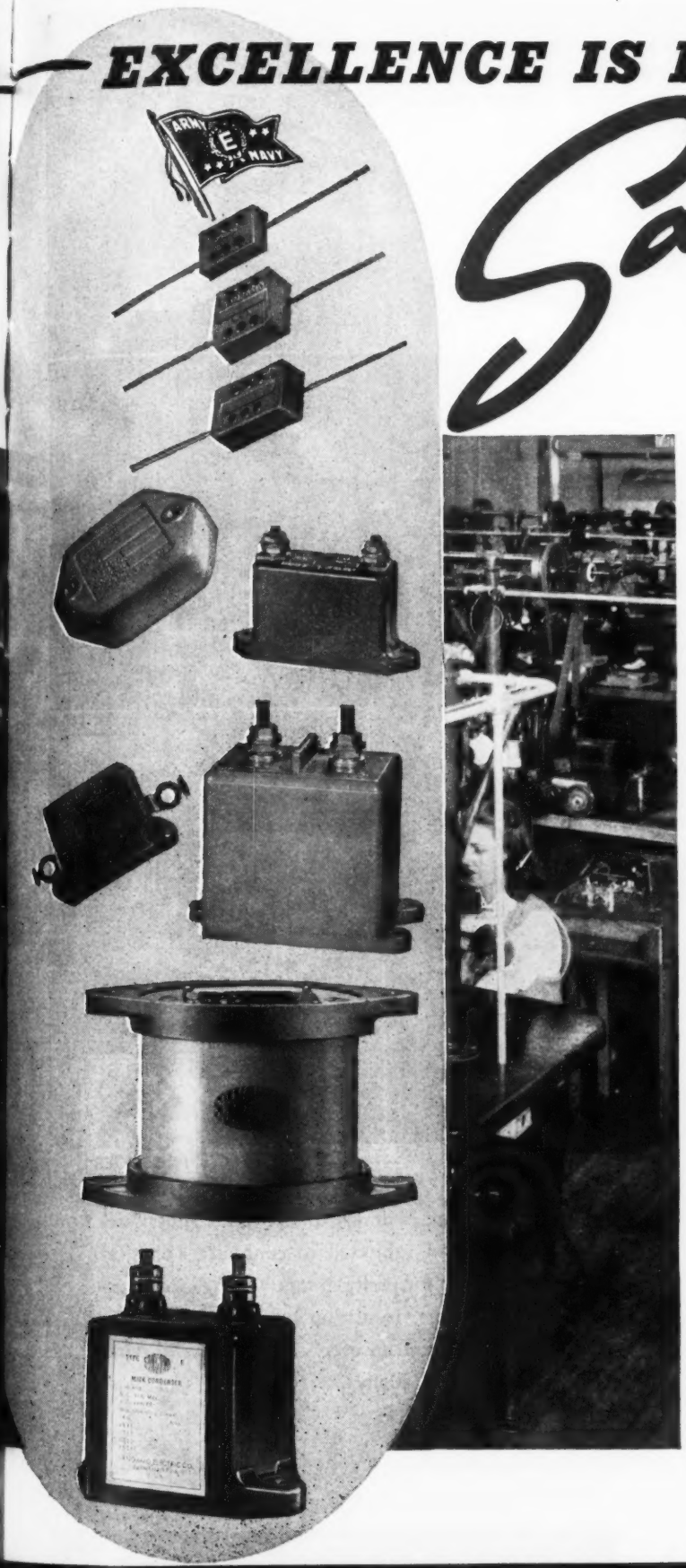
Sangamo

MICA CAPACITORS

•

Capacitor Assembly

•



A MICA CAPACITOR consists of a number of alternate layers of mica film and a conducting metal plate. As the capacity of the unit varies directly with the area of the active surface of the plate and inversely with the thickness of the dielectric, these factors must be accurately controlled in order to produce a satisfactory capacitor.

The assembling or stacking of these units may be done by hand with the use of mechanical stacking fixtures, or automatically, by utilizing special assembly machines. Since 1929, automatic machines, designed and developed by Sangamo, have been used for stacking many types of Sangamo capacitors. This method of stacking has insured accurate positioning of the foil, which is essential for long life and trouble-free operation of any capacitor unit. The automatic assembly machines are designed so that the length of each foil is very accurately controlled; as the mica previously has been gauged to within very close limits and inspected for all defects or flaws, a uniform capacitor results. Since many of the large capacitors consist of series sections and comprise in all many hundreds, and in some cases thousands, of pieces of mica, automatic stacking insures consistent quality and facilitates increased production. A large battery of these assembling machines enables Sangamo to produce many thousands of capacitors of all values each day and each is built with that precision and care required to insure dependable operation in all types of electronic equipment.

COMPANY SPRINGFIELD ILLINOIS

• • WATT HOUR METERS • • • TIME SWITCHES • • •

IN FIFTEEN short years Essex *Extra-Test* Magnet Wire has reached an enviable "first-choice" position in the field.

A natural advancement — for it has always been a rigid Essex policy never to be content with just good wire. Every spool that leaves the plant must carry *extra-good* wire — the best that can be made — whether it is size 50 or 0; round, square or rectangular; bare, covered or enameled.

Such superiority is the direct result of extensive development work and severe laboratory tests. Made from commercially pure electrolytic copper, Essex Magnet Wire is drawn to size under most careful supervision, and subjected to continuous physical and electrical tests for purity, temper, elongation, conductivity, and gauge. Insulation tests are equally frequent and severe. And in every case, *results must exceed standard requirements.* Many are far in excess of most rigid specifications.

That's why Essex Magnet Wire has been so literally labeled, *"Extra-Test"*.

ESSEX WIRE CORPORATION
FORT WAYNE 6, INDIANA

THIS SPRING FWDs ARE DOING

More Work WITH *Less Manpower*

Embodied in this FWD Model SU is the accumulated experience of 35 years of four-wheel-drive leadership . . . a truck that has won extraordinary recognition and endorsement of motor truck users, in less than four years, to the extent of $75,000,000.00 in purchases.

The FWD Model SU Truck commands the attention of all who know quality. Superior power, ruggedness, speed and ability to perform without waste, are recognized FWD truck values that help overcome today's handicaps of manpower shortage.

FWDs are multiplying available manpower by increasing the range and capacity of trained crews. FWDs go anywhere . . . get crews and equipment to any operation, off the highway or on it, in any weather, over even the tougest terrain, all year 'round, on trouble-shooting emergencies or routine jobs. Figure less depreciation, more years, more jobs done faster with FWDs . . . less upkeep and operating costs . . . less tire-wear . . . more work per gallon of gas, with balanced power delivered to all four wheels!

FOR ESSENTIAL INDUSTRIES, a limited number of FWDs will be available this year. Phone, wire or write us, or see the nearest authorized FWD dealer.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin
Canadian Factory: KITCHENER, ONTARIO

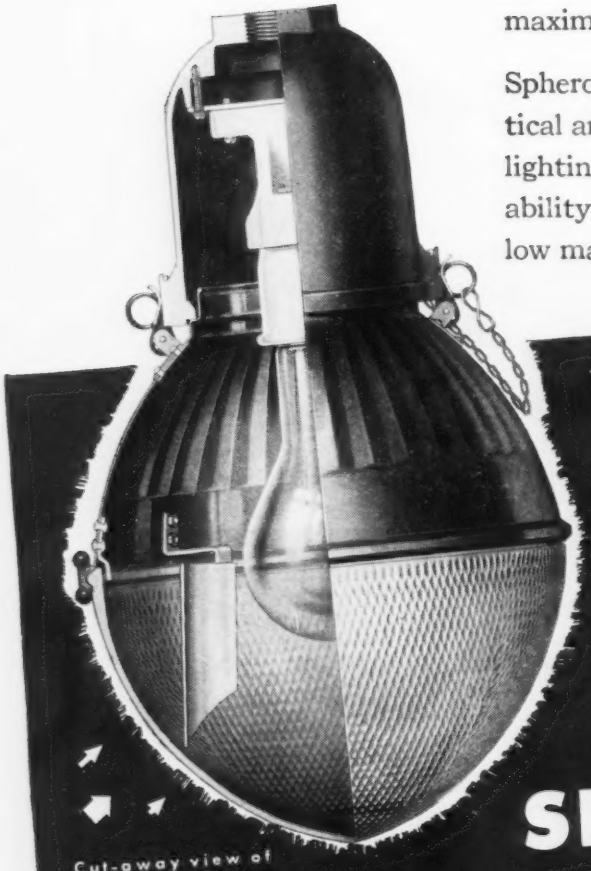
FWD TRUCKS
THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

FWD Distributors

ARIZONA—Arizona-Cedar Rapids Co., 401 N. 1st St., Phoenix, Ariz.; CALIFORNIA—Hillman-Kelley Company, 1000 Macey St., Los Angeles and FWD Pacific Co., 469 Bryant St., San Francisco 7, Calif.; COLORADO—Liberty Trucks & Parts Co., P.O. Box 1889, Denver 1, Colo.; IDAHO—Intermountain Equipment Company, Broadway at Myrtle St., Boise, Idaho; MONTANA—Steffeck Equipment Co., 11 E. Cutler St., Helena, Mont.; NEVADA—Allied Equipment Co., Reno, Nevada; NEW MEXICO—The Myers Company, Las Cruces, N. M.; OKLAHOMA—Halliburton Oil Well Cementing Co., P.O. Drawer 471, Duncan, Okla. and Oklahoma Road Mch. Co., Muskogee, Okla.; OREGON—Feenaughty Machinery Co., 112 S.E. Belmont St., Portland 14, Ore.; UTAH—Cate Equipment Company, 49 E. 9th So., Salt Lake City, Utah; WASHINGTON—Feenaughty Machinery Co., 1028 6th Ave., So., Seattle 2, Wash. and Feenaughty Machinery Co., 715 N. Division St., Spokane, Wash.; WYOMING—Wortham Machinery Co., 517 W. 17th St., Cheyenne, Wyo.

YOU can get the kind of light you want, *where* you want it, with L-M Spherolite. From a concealed source, the Spherolite distributes the light over a wide area, producing maximum visibility with a minimum of glare.

Spherolite has many desirable features that make it practical and economical—a sound investment for every outdoor lighting job. Its permanence, adaptability, interchangeability, tight seals against moisture and dirt, and resulting low maintenance make Spherolite exceptionally economical.



Cut-away view of Spherolite showing scientifically designed fluted reflector, which puts all the light to work.

When you plan street lighting plan . . . SPHEROLITE-ing!

Line Material is one of the oldest and largest manufacturers of street lighting equipment—with a complete line of standards, brackets, luminaires, transformers, control and protective equipment. Its field engineers are experienced; the wide variety of L-M equipment enables them to give you sound advice and valuable help in selecting the proper equipment for *your* lighting problem.

Don't fail to discuss your plans with one of these capable counselors. Call or write the nearest L-M office, or Line Material Company, Milwaukee 1, Wisconsin.

LINE MATERIAL
STREET LIGHTING EQUIPMENT

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters
Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street Lighting Equipment

More and More He Relies on L-M Pole Line Hardware

Preference for L-M Pole Line Hardware has been increasing rapidly for many years, as indicated graphically by the growing size of the L-M lineman.

This is due to the fact that L-M Pole Line Hardware is designed for practical, long life service in the field . . . is conveniently packed for handling . . . just the kind of equipment that linemen have grown to rely on.

This record of quality and service has made L-M one of the largest suppliers of the Electrical Utility Industry for over 30 years.

For full information write to Line Material Company, Milwaukee, Wisconsin.

★

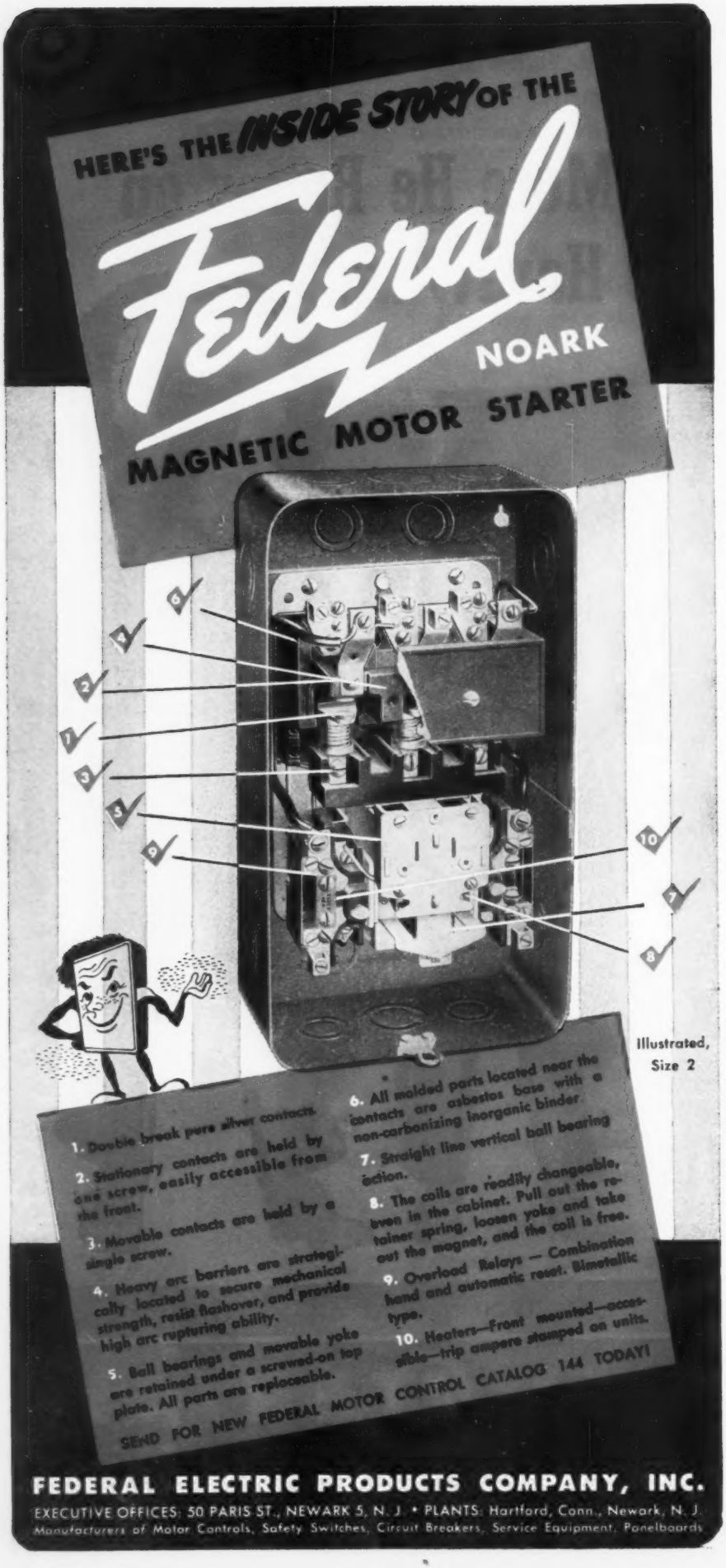
1920 1930 1940

LM

LINE MATERIAL

POLE LINE HARDWARE

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street Lighting Equipment


HERE'S THE INSIDE STORY OF THE
Federal
NOARK
MAGNETIC MOTOR STARTER
Illustrated, Size 2
1. Double break pure silver contacts.
2. Stationary contacts are held by one screw, easily accessible from the front.
3. Movable contacts are held by a single screw.
4. Heavy arc barriers are strategically located to secure mechanical strength, resist flashover, and provide high arc rupturing ability.
5. Ball bearings and movable yoke are retained under a screwed-on top plate. All parts are replaceable.
6. All molded parts located near the contacts are asbestos base with a non-carbonizing inorganic binder.
7. Straight line vertical ball bearing action.
8. The coils are readily changeable, even in the cabinet. Pull out the retainer spring, loosen yoke and take out the magnet, and the coil is free.
9. Overload Relays — Combination hand and automatic reset. Bimetallic type.
10. Heaters—Front mounted—accessible—trip ampere stamped on units.
SEND FOR NEW FEDERAL MOTOR CONTROL CATALOG 144 TODAY!
FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
EXECUTIVE OFFICES: 50 PARIS ST., NEWARK 5, N. J. • PLANTS: Hartford, Conn., Newark, N. J.
Manufacturers of Motor Controls, Safety Switches, Circuit Breakers, Service Equipment, Panelboards

Reel Roller (409)

A roller for dispensing material wound on a reel has been announced by the M. B. Austin Co. This reel roller has a ramp for loading, five adjustable slots to accommodate varying reel diameters. One roller will take any size up to 30 in. wide; for larger reels, two rollers can be mounted end to end. Each roller has a maximum capacity of 4,000 lb., over-all dimensions are 4 in. high x 33¾ in. wide x 26½ in. deep; weight 75 lb. The steel frame is painted bright orange to make it readily visible on the floor and to help eliminate accidents. Available on priority rating of AA-3 or better.

A-C Test Set (410)

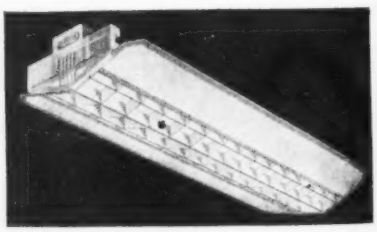
General Electric is making a portable a-c test set for 115- or 230-volt, 60-cycle operation and capable of supplying test voltages from 0 to 15,000 volts. This test set is mounted on a three-wheeled truck and is 36 in. high, 49 in. long and 30 in. wide.

The equipment consists of a step-up transformer, built-in electric timing clock, double-scale switchboard type voltmeter, voltmeter scale selector switch and air circuit breaker with instantaneous overload trip. A 15-ft. supply cord and plug and two 15-ft. shielded high-voltage leads with insulated test handles are included.

Resistor (411)

Techtmann Industries Inc. has developed a bank type resistor, which it states can be built with from 2 to 24 in a bank. Dimensions for the six-frame resistor are: Frame length, 23 in.; width, 11⅛ in.; depth, 4¼ in. For banks of more or less than six resistors, add or deduct three inches from length of frame for each unit added or omitted. Cores, elements, straps and binding posts may be purchased separately, according to the manufacturer, who states that, in event of burnout of the element, a new element may be wound around the core in a short time.

F Luminaire (412)



Edwin F. Guth Co. is making a fluorescent luminaire, which combines lamp shielding and glass diffusion. Down lighting is through eggcrate louvres and diffused side lighting through glass panels. Called the eggcrate Aristotle, this fixture has panelled and die cut ends; glass panels and eggcrates are separately removed for maintenance. For four 40-watt F lamps, the unit is available for individual or continuous installation and can be suspended from ceiling or mounted flush.

Steel Fixture (413)

A. L. Smith Iron Co. has announced a new all-steel louvered lighting fixture. This fixture has steel hinged eggcrate louvers made in two sections; wiring runs along a steel channel.

For New Wiring and Rewiring

FLAMENOL*

BUILDING WIRE

SMALL DIAMETER—THERMO-PLASTIC INSULATED

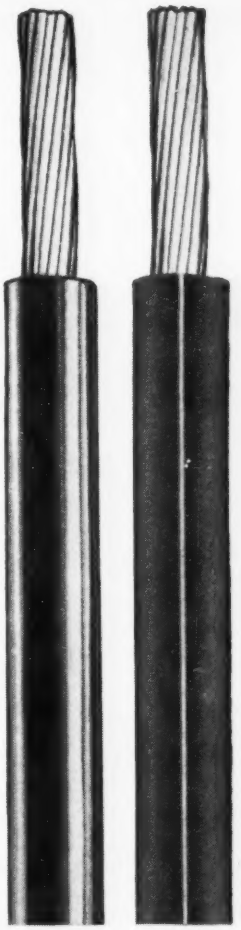
Both new wiring and rewiring can be done more easily with Flamenol Building Wire. Its small diameter, comparative light weight and smooth, glossy finish make it easy to handle and to pull in conduits. Stripping may be done quickly; there is no overall braid on the wire. Moreover, Flamenol wire's small diameter enables more copper to be placed in conduits. This is particularly helpful for rewiring jobs.

Flamenol Building Wire is available in two types in sizes 14 to 2,000,000 CM: Type SN for general purpose wiring; Type SNW for wiring in conduit in wet locations wherever lead covered wire can be used. The insulation of both types has long life, is high in dielectric and mechanical strength and is resistant to oils, acids and alkalies. Type SNW insulation also has a low moisture absorption rate.

FOR FURTHER INFORMATION on Flamenol Building Wire or G-E Conduits or Wiring Devices, see the nearest G-E Merchandise Distributor or write to Section CDW453-18, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

*Reg. U.S. Pat. Off.

BUY WAR BONDS AND HOLD THEM



TYPE SN FOR GENERAL PURPOSE WIRING

TYPE SNW FOR WIRING IN WET LOCATIONS

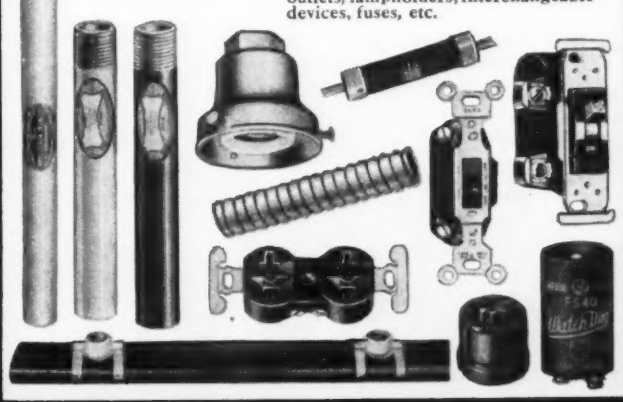
BREAK THE BOTTLENECK OF RESTRICTIVE CAPACITY

J. A. Hill, domestic utilization engineer, Pacific Gas and Electric Co., San Francisco, Calif. says, "Adequate wiring is a must for all post war homes. Unless this electrical industry succeeds in breaking the bottle neck of restrictive capacity our post war customers will never realize the benefits of "Electriliving".

ADEQUATE WIRING — THE KEY TO THE HOME OF TOMORROW — SERVES AND SAVES

G-E CONDUITS AND WIRING DEVICES

There are G-E conduits and wiring devices for every purpose: G-E white zinc-coated rigid conduit, G-E black enamelled rigid conduit, EMT, flexible conduit, Fiberduct and numerous wiring devices including switches, outlets, lampholders, interchangeable devices, fuses, etc.



GENERAL ELECTRIC

Hear the G-E radio programs: "The G-E All-Girl Orchestra" Sunday 10 P.M. EWT, NBC: "The World Today" news, Monday through Friday 6:45 P.M. EWT, CBS: "The G-E House Party" Monday through Friday 4:00 P.M. EWT, CBS.

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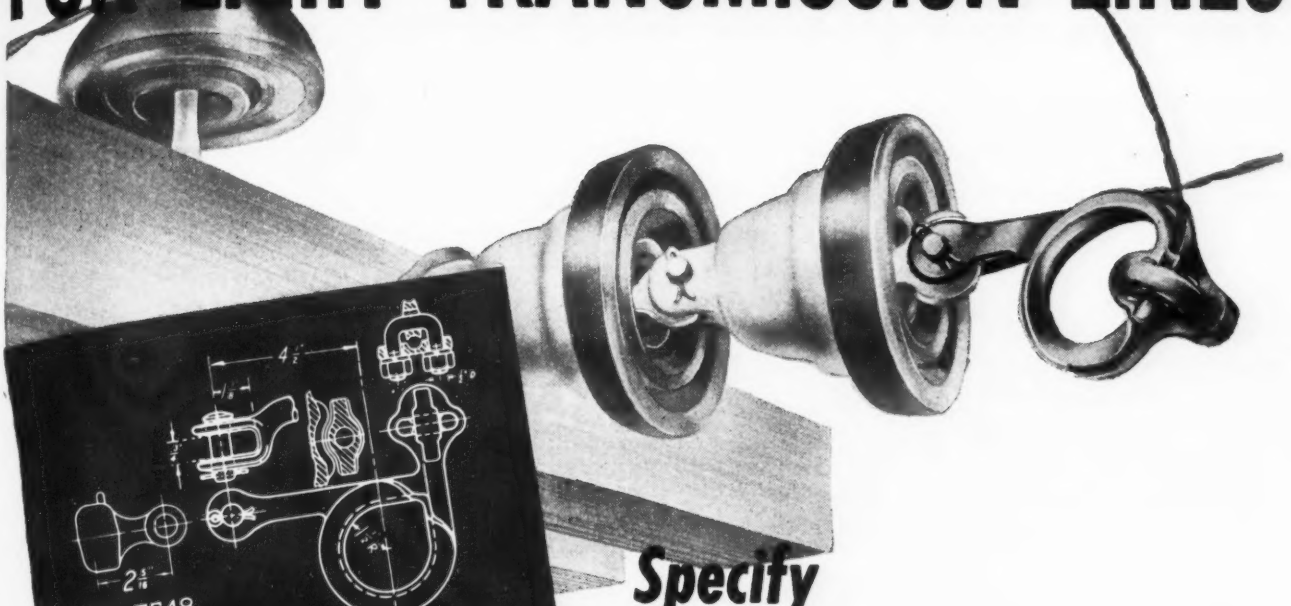
LIMITED
SEATTLE • PORTLAND • SAN FRANCISCO • LOS ANGELES
over 20 years
SERVING
THE INDUSTRIAL WEST

FOR LIGHT TRANSMISSION LINES



Specify

Drop Forged Clamps

Designed for dead-ending the lighter duty transmission and distribution lines — hundreds of thousands of these familiar and accepted snubbing type clamps are in use in all parts of this and other countries — and for good reasons . . .

- Forged steel gives a light-weight clamp of adequate strength.
- A short connection length protects the conductor against vibration effect.
- Ample radius of snub, smooth cable seat and long clamping keeper prevent damage to the conductor.
- Side opening type is easy to install and work with hot line tools.
- Reversible two-groove keepers accommodates a wide range of conductor sizes.
- For full detail, write — Engr. Dept. C.F. Div.

Through Your Jobber or Manufacturer Only

B-T-C

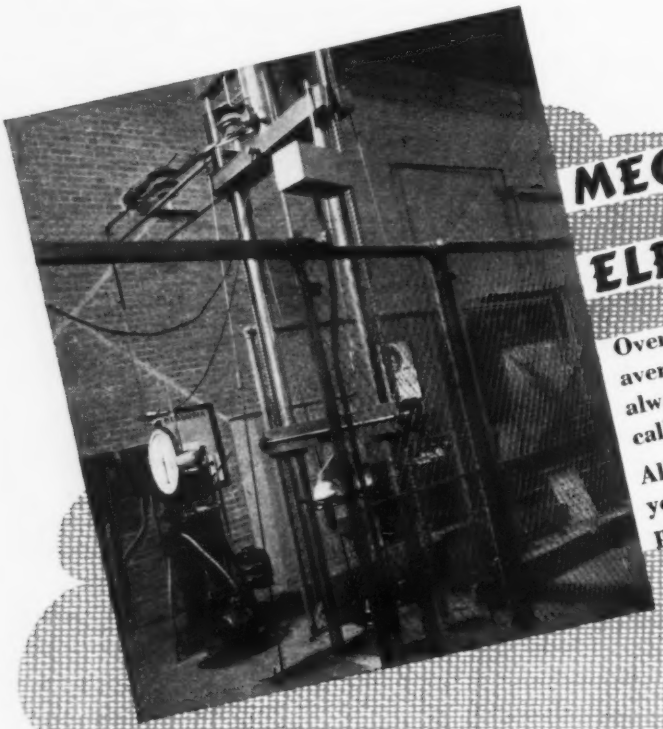
Drop Forged Hi-Line Hardware

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK

✓ ✓ ✓ ✓ CHECK ALL

for present values and permanence . . .

Every listed characteristic of a Locke Suspension insulator means something to you, in longer service life, lower maintenance and reduced construction costs. ***And these characteristics remain at the same high levels throughout the life of the insulator.***



MECHANICAL AND ELECTRICAL STRENGTH

Over twenty years ago Locke recognized the fallacy of average values. Locke Suspension Insulators have always given you something more than the specification called for.

All Locke published M&E values are minimum. For your convenience, this minimum M&E strength is plainly marked on the insulator cap.

FLASHOVER VALUES

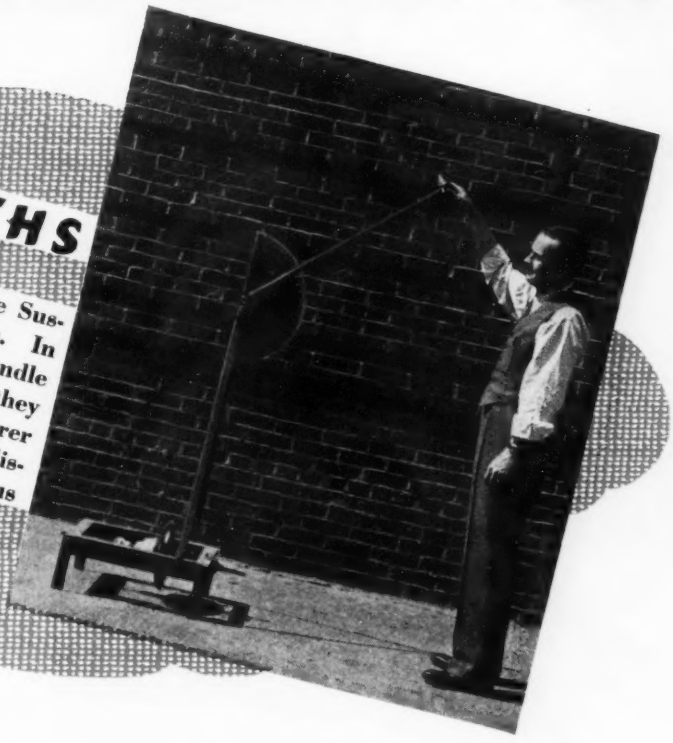
Flashover values—particular the wet flashover—of an insulator string is an extremely important feature. Locke Suspension insulators are designed for the highest possible wet flashover value.

LOCKE *Insulator*

THE CHARACTERISTICS

IMPACT STRENGTHS

The particularly high impact strengths of Locke Suspension insulators save you money in many ways. In the first place, they make the units easy to handle faster without breakage in construction. Second, they reduce maintenance because they withstand severer mechanical and thermal shocks in service. And by discouraging vandalism, they lessen attempted malicious breakage.



LEAKAGE DISTANCE

The provision of ample effective leakage distance was the primary consideration when Fred M. Locke, almost 60 years ago, designed his first insulator and it has been a primary factor in Locke design ever since.

Locke Suspension insulators not only give you ample leakage distance, but a designed leakage path which will stay clean and effective over longer periods.

These are the characteristics that determine the service you get from the insulators you buy. In the Locke plant exact controls are operating continuously 24 hours a day to properly maintain all these characteristics. How effective this control is can be gathered from the fact that no failures of Locke Suspension insulators due to other than outside influences are on record.

Corporation BALTIMORE MARYLAND

Know your WIREMOLD

BUSINESS BUILDER IN TOMORROW'S MARKET FOR ADEQUATE WIRING

WIREMOLD RACEWAYS

Ten basic surface metal raceway wiring systems . . . each complete with its own series of fittings . . . inter-connectable one with another . . . providing the ideal method of wiring new structures and rewiring buildings.

WHERE TO USE THEM

In factories, hospitals, offices, warehouses, public buildings, stores, hotels, schools, farm buildings and airport structures . . . where wiring for light, power or communications is installed ON THE SURFACE for convenience and safety.

HOW TO USE THEM

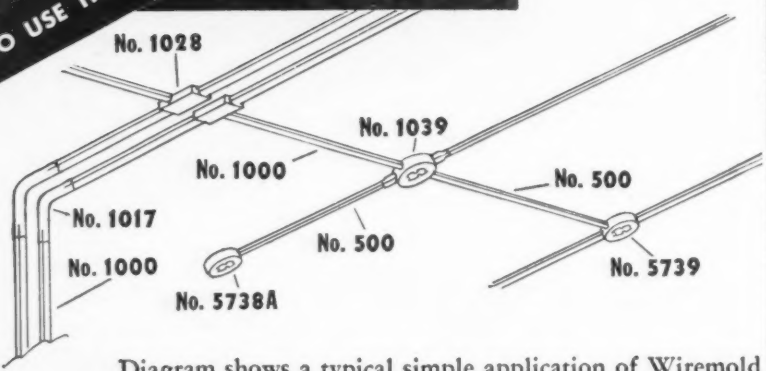


Diagram shows a typical simple application of Wiremold Raceways required in almost every case where lighting modernization dictates relocation and increase in the number of outlets. Quickly installed, unobtrusive Wiremold Raceways eliminate all necessity of channeling plaster walls or ceilings or ripping out old wiring. Know your Wiremold and you know the answers to all problems of this kind. Write us direct for Catalog and Wiring Guide No. 16A.

ELECTRICAL MAINTENANCE MEN

Wiremold Engineering Data Sheets and other literature are designed to help you solve wiring problems. If you are not receiving this literature, send us your name TODAY.

THE WIREMOLD COMPANY, HARTFORD 10, CONN

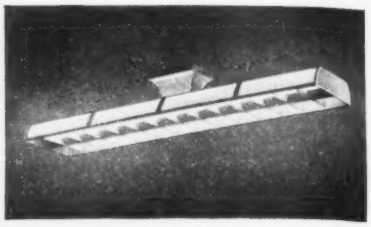
NEMA

ARMY E NAVY

F Fixture (414)

Following relaxation of restrictions on manufacture, the Wakefield Brass Co.'s Grenadier luminaire is available again, according to recent announcement by the company. The design is essentially the same as the prewar model except for small construction changes to permit assembly of continuous units from stock parts rather than on special order.

The unit is a two-lamp, 40-watt fixture with reflector section measuring 2¾ in.



Translucent plastic side panels prevent direct view of lamps from the side and the bottom of the reflector is equipped with transverse louvers for shielding the lamp from the end view. Relamping is done from the top of the reflector without dissassembling the unit.

The unit may be secured as a close mounted ceiling fixture or for lower mounting. Light distribution is approximately 41% upward and 45% downward, with over-all efficiency of 86%, according to the manufacturer. The frame is steel and is finished in grey enamel. Reflecting surfaces are white enamel and face downward.

Industrial Unit (415)

Curtis Lighting Inc. has announced a new industrial fluorescent unit which, it states, also can be used as an exposed troffer in certain factory office and drafting room installations. Construction is said to be similar to the company's No. 1626-C series except that the reflector is narrower and deeper and is finished white inside and out. The unit is available with or without louvers and for two and three 40-watt lamps. Louvers provide 25° crosswise and 15° lengthwise shielding. Dimensions are 48 in. long, 11¾ in. wide, 7⅝ in. high to top of ballast. Units are wired for 110-125 volts a-c but can be furnished for 220-250 volts on request.

Magnetic Comparator (416)

General Electric has redesigned its magnetic comparator for inspecting ferrous parts. The redesigned unit has a grey steel case with sloping front panel on which are located the indicating instrument, variable-voltage transformer, rheostats and switches. Graduated dial plates on the sensitivity and balance control rheostats have been added and a light now indicates when the power is on. Receptacles for making connections to the test fixtures and power sources are located at the back of the case.

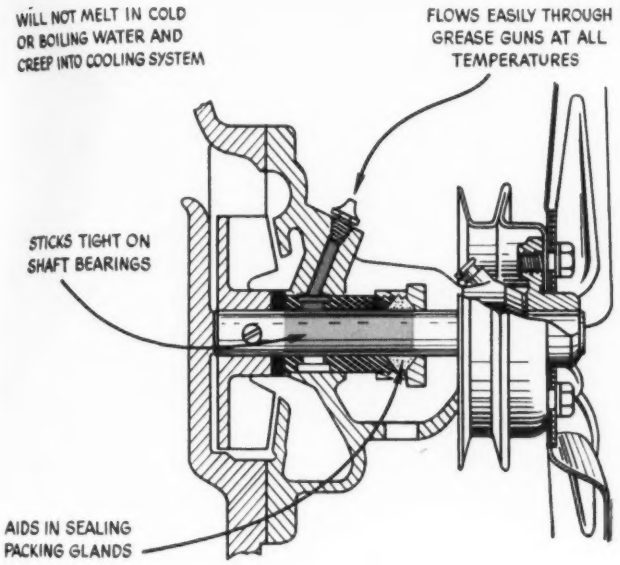
Tester (417)

Associated Research, Inc. is making a crankless insulation resistance tester, Model 238 Vibrotest. This instrument is a spotlight galvanometer having a 100-mm. scale calibrated 0-20,000 megohms direct reading at a potential of 500 volts d-c self contained. Power is from two No. 6 dry cells mounted in the back of the instrument. A guard circuit is included for high ranges, the announcement states. Dimensions are 16 x 11 x 9 in.; weight 24½ lb.

STANDARD ENGINEERS NOTEBOOK

VOL. 2-E No. 2

Waterproof grease prevents clogging


WILL NOT MELT IN COLD OR BOILING WATER AND CREEP INTO COOLING SYSTEM
FLOWS EASILY THROUGH GREASE GUNS AT ALL TEMPERATURES
STICKS TIGHT ON SHAFT BEARINGS
AIDS IN SEALING PACKING GLANDS

Where truck and other engines are equipped with grease-lubricated water pumps in which cooling water comes in contact with grease, RPM Water Pump Grease is recommended.

RPM Water Pump Grease is especially compounded to make it waterproof. Neither hot nor cold water will change its characteristics. Because it has an extremely high melting point, high engine temperatures and boiling water will not cause it to melt and creep into the cooling system. Thus, the formation of grease scum on water, which tends to clog radiator tubes and other passages, is prevented.

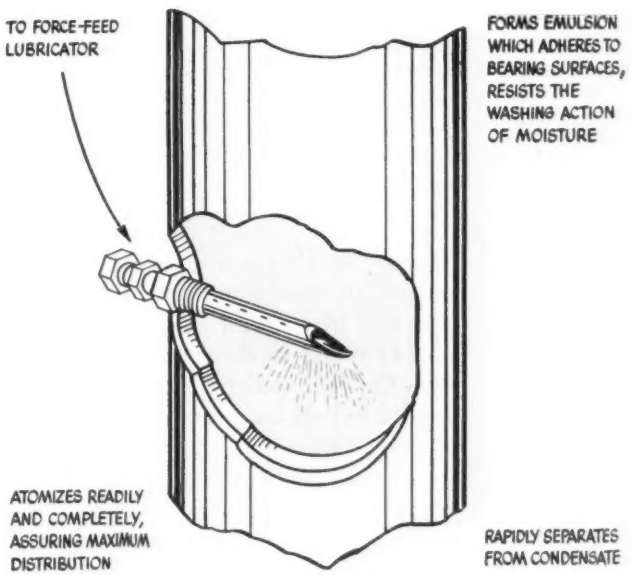
Highly resistant to change in structure, RPM Water Pump Grease sticks tight on whirling pump shafts. This not only prevents waste, but assures lubrication of pumps over extended periods. It forms a waterproof seal in glands, preventing leaks, keeps a protective film on bearings, and pumps freely through grease guns in all seasons.

Oil reduces boiler trouble

Because it will separate rapidly from water, Calol Cylinder Oil-135 FX is specially recommended for use in steam cylinders of engines in condensing steam plants, heating plants, distilled water ice plants and marine engines where the condensate is returned to the boiler. This oil is adaptable for steam pressures up to 160 pounds gauge and temperatures not exceeding 375° F.

Calol Cylinder Oil-135 FX is lightly compounded, well filtered, and of medium viscosity. It is one of a large group of steam cylinder and valve oils manufactured by Standard of California. In this group there is an oil to meet individual operating conditions in every plant—temperatures from 240° F. to 800° F. and pressures as high as 650 pounds.

A handy booklet containing information about each oil, "Vital Protection For Industrial and Marine Equipment" is available, free. Write Standard of California, 225 Bush Street, San Francisco, 20.


TO FORCE-FEED LUBRICATOR
FORMS EMULSION WHICH ADHERES TO BEARING SURFACES, RESISTS THE WASHING ACTION OF MOISTURE
ATOMIZES READILY AND COMPLETELY, ASSURING MAXIMUM DISTRIBUTION
RAPIDLY SEPARATES FROM CONDENSATE

Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert help — make your maintenance job easier. Call your Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California.

STANDARD OF CALIFORNIA

Like "STERLING" *on Silver*

Honor this emblem! And honor the man who wears it in his lapel. It's the symbol of honorable discharge from our armed forces.

This button testifies that its wearer "knows there's a war on"—he was in it! He left his family and friends, his business and his comfortable living habits, and went out to do a dirty, unpleasant job—for you. Patiently, he sweated out months of tedious training . . . submitted to a rigid discipline that comes hard to an independent American youngster . . . probably placed his very life in the hands of Providence . . . so you and I and the fellow across the street wouldn't have to Heil that Heel!

Now he's back . . . more than a million of him. And the only way you can spot him is by that little gold button in his lapel. Uncle Sam put it there . . . a sort of visible "Well done!"

Watch for the Honorable Discharge Emblem. And when you see one, give at least a mental salute to its wearer—a fellow who was ready, if it had to be that way, to die for you and me.

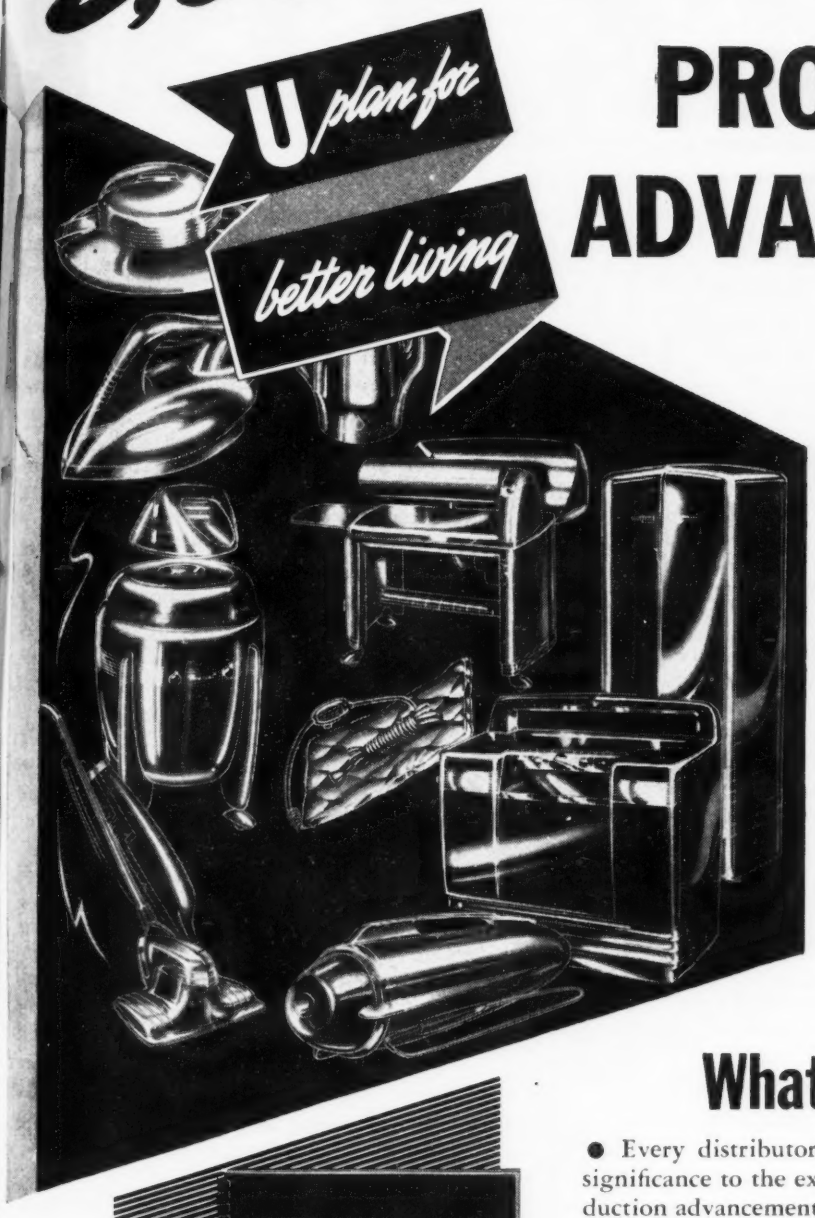
●

As with our entire production facilities —now with our advertising—Railley's energies are single-mindedly devoted to America's war effort.

Railley
CORPORATION · CLEVELAND, OHIO
ORIGINATORS OF THE
PIN-IT-UP LAMP

Now Making for Victory: X-RAY PARTS • GAS PROOF COVERS
ROCKET PROPULSION UNITS • DUMMY FUZES • PRACTICE CARTRIDGES

$3,000,000. worth of PRODUCTION ADVANCEMENT*

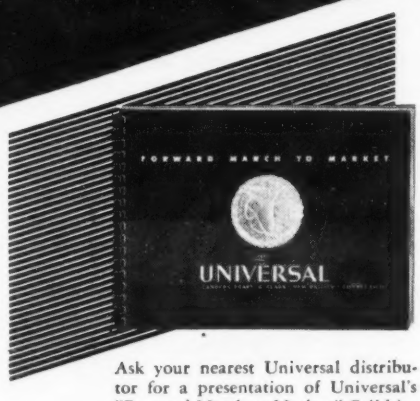


• In addition to the million dollars being expended for redesign, over three million dollars is being spent to insure the production of even better Universal post-war appliances and housewares. New production techniques are being introduced . . . new systems to speed processing at lower costs are being installed . . . finer precision methods employed and "quality control" improved. The entire flow of materials "from metal to merchandise" is coming in for improvement all along the line.

What it Means to YOU!

• Every distributor and dealer should attach powerful sales significance to the expenditure of three million dollars for production advancement.

• "Quality Control" from metal to merchandise is one key to Universal post-war appliance leadership. It gives assurance that servicing will be reduced to a minimum, and points the way to new heights in utility and perfection. The combination of these factors will mean greater salability—greater dealer and customer satisfaction—*a greater value for the Universal franchise in your community.*



Ask your nearest Universal distributor for a presentation of Universal's "Forward March to Market." Call him today for full franchise information.

* **No. 2 in Universal's "Forward March to Market" Series.** *(No. 1 in the series "$1,000,000 Worth of New Design" appeared in January. In May issues, look for No. 3 in this series "42 Million Customers Worth of Good Will")*

UNIVERSAL

LANDERS, FRARY & CLARK • NEW BRITAIN, CONN.

Universal Electrical Appliances distributed in Canada exclusively by Northern Electric Company, Ltd

Check List

Today many utilities are taking a fresh look at the oil circuit breakers which protect their equipment and service continuity. Rapid system growth, wartime buying restrictions, important developments in circuit breaker design — these are some timely reasons why. Thus Allis-Chalmers now offers the following check list to utilities *as a partial guide to circuit breaker replacement when buying again becomes possible.*

☑ **Do you want to get increased breaker capacity without installing new breakers?**

PERHAPS your present breaker interrupting capacity is inadequate to handle the higher short circuits and voltage surges imposed by system growth... yet, major changes in station layout to accommodate additional breakers might not be practicable just now. If this is your problem, Allis-Chalmers' answer is to modernize — to replace plain-break contacts of existing oil circuit breakers with modern Ruptors (or to replace present Ruptors with larger ones).

The Ruptor is an Allis-Chalmers arc-enclosing device which limits arc energy, keeps tank pressures low, quenches arcs lightning-fast... *both reduces maintenance costs and gives added capacity.*

NOTE: All Allis-Chalmers oil circuit breakers above 50,000 kva rating are Ruptor-equipped.

☑ **Do your breakers meet present NEMA standards for interrupting time?**

ALLIS-CHALMERS makes a complete line of quick-clearing 8-cycle circuit breakers, meeting the NEMA Standard for outdoor oil circuit breakers, 69 kv and below. Allis-Chalmers also meets the new 5-cycle NEMA Standard for circuit breakers of 115 kv rating and above.

☑ **Are you getting a satisfactory number of oil circuit breaker operations between maintenance periods?**

SLUDGING OF OIL and burning of contacts can create such a maintenance burden that old-type circuit breakers become uneconomical to operate.

Allis-Chalmers' field and laboratory tests prove that Ruptors will enable breakers to handle *many more circuit interruptions* before requiring inspection and renewal of oil or contacts. This is a result of limited release of arc energy, since the Ruptor device greatly lessens the amount of oil exposed to the arc.

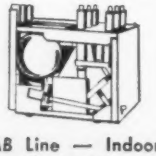
☑ **Have service interruptions been traced to mechanical difficulties in present circuit breakers? Faulty adjustment?**

ALLIS-CHALMERS' "permanent adjustment" — assured by rigidity in stationary parts and the generous cross-sections of moving parts — is your guarantee of dependable breaker performance, with adjustment maintained under all operating conditions. Stop nuts and other reliable locking means are used throughout the breaker structure.

☑ **Does arcing cause excessive maintenance on contacts of present breakers?**

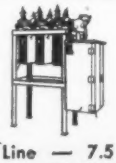
ALL MOVING and stationary contacts on Allis-Chalmers' complete line of oil circuit breakers are of special arc-resisting alloys, and main contacts are liberally silver-surfaced, giving much longer service-life than older type contacts. And remember that most Allis-Chalmers

E-145 — 200-400 amp, 2500 volts, 15,000 kva int. cap.



AB Line — Indoor air blast; 15 kv, up to 500,000 kva.

D-20 — 600-1200-2000 amp, 5 kv, 50,000 kva.



O Line — 7.5 to 46 kv, 50,000 to 250,000 kva.

FZO-150 — 15 to 69 kv, 500,000 to 1,500,000 kva.

ALLIS CHALMERS *makes a*

HOW ADEQUATE IS YOUR SYSTEM PROTECTION TODAY? HERE ARE MAIN OIL CIRCUIT BREAKER FACTORS TO BE CONSIDERED NOW

oil breakers are Ruptor-equipped — slashing time the arc exists between circuit breaker contacts.

☑ **Have you considered the advantages of complete circuit breaker weatherproofing?**

RECOGNIZING the importance of weatherproofing for breaker safety, Allis-Chalmers has designed the *FZO-150* outdoor oil circuit breaker.

The new breaker has compact, smooth, all-welded steel top . . . giving maximum protection against wind-driven sand, snow, sleet and water . . . no crevices to collect water and dirt. All external conduits have been eliminated. Bushing transformer wiring is run in isolated ducts incorporated in the top frame.

☑ **Do your circuit breakers meet present NEMA and AIEE Insulation Standards?**

THE DIELECTRIC strength of Allis-Chalmers circuit breakers is always equal to or exceeding the latest NEMA and AIEE Standards. All bushings have the capacity to withstand mechanical impacts, as well as stresses due to high inrush currents.

☑ **Have you considered ultra-rapid breaker reclosing for service continuity on high voltage overhead lines?**

MOMENTARY SURGES on transmission lines — due to lightning or switching — need not mean breaks in system continuity. With ultra-rapid reclosing of breakers, such faults can be cleared from the line within 20 cycles, without disturbing the timing of synchronous machinery.

Ultra-rapid pneumatic operators — available in Allis-Chalmers outdoor oil circuit breakers rated 15 kv and higher, 500,000 kva and above — are simple in operation, compact, economical. Allis-Chalmers also offers high speed reclosing with a-c and d-c solenoid operators.

☑ **Is a d-c supply readily available for solenoid operation of high speed breakers?**

IF NOT, and if you want to avoid the use of rectifiers, for conversion from an a-c power source, Allis-Chalmers recommends a pneumatic operator.

Using the automatically maintained, pre-stored energy of compressed air to close the breaker, pneumatic operators give the quick reversal of moving parts required during reclosure . . . provide maximum closing speed throughout the stroke.

☑ **Could you profit by engineering assistance in applying new oil circuit breakers to changed system conditions?**

IN ADDITION to the actual equipment you buy, Allis-Chalmers offers engineering cooperation, backed by 40 years of experience in the design and manufacture of protective equipment for the electrical industry.

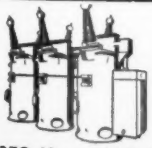
For more detailed information on the complete A-C line of oil circuit breakers, call our nearby district office. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

CHECK THESE NEW

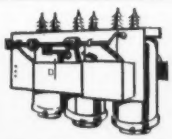
Allis-Chalmers Breaker Features:

- ☑ **Ruptors for 5-cycle opening of larger outdoor breakers.**
- ☑ **Modern high-speed solenoid operators.**
- ☑ **Pneumatic operators, for ultra-rapid (20-cycle) reclosing.**
- ☑ **All-welded "Unitop" frame on streamlined breakers.**

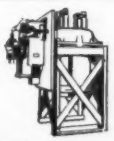
A 1835



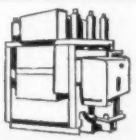
BZO-60 — 115 to 230 kv, 1,000,000 to 2,500,000 kva.



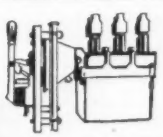
FZ Line — 15 to 34.5 kv, up to 2,500,000 kva.



DZ Line — Up to 2000 amp, 15 kv; 100,000-500,000 kva.



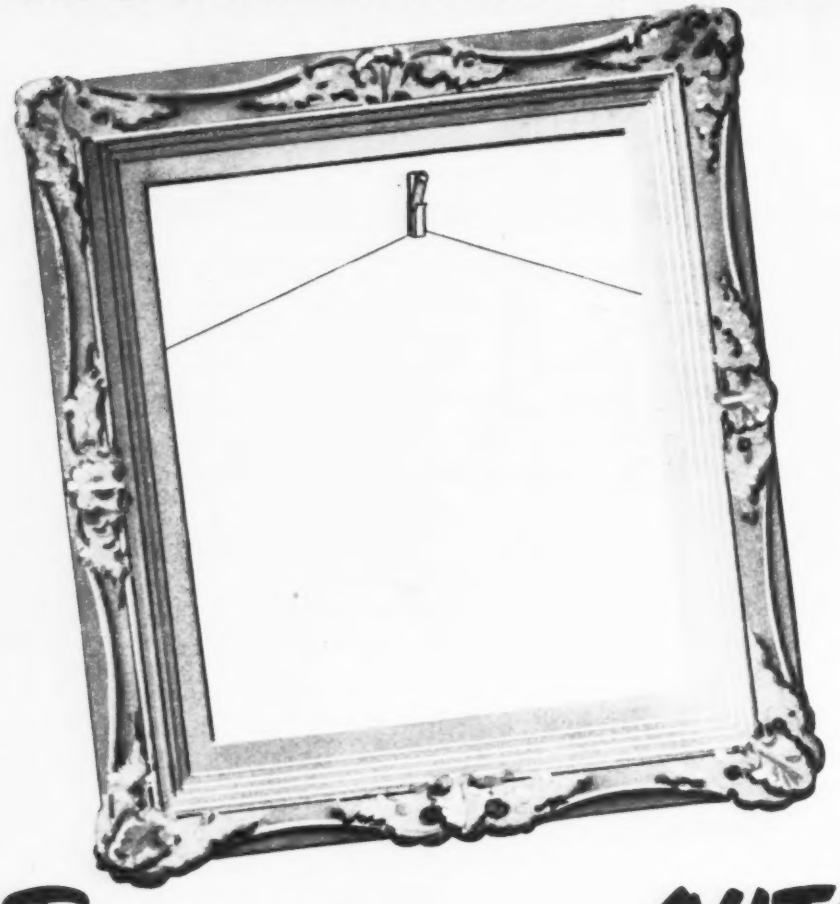
AM Line — Magnetic air; 5 kv, up to 150,000 kva.



E-47 — 400-600-800 amp, 5 kv, 25,000 kva int. cap.

a Full Line of Circuit Breakers

BUY U. S. WAR BONDS AND HOLD THEM!



Rosy pictures are **OUT!**

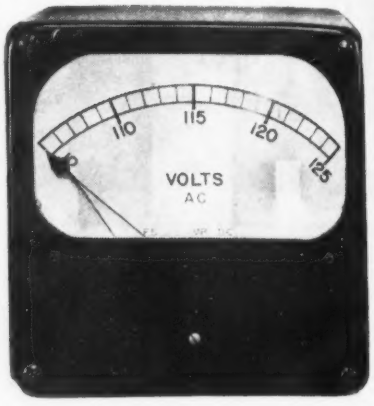
We're going to wait until victory is a fact before disclosing the Smoot-Holman luminaires-of-the-future. No doubt many of our friends and customers would like to see us start producing more prewar items... but for those who expect the end of the war to bring something new and different we have a few surprises filed away in our blue print cabinet.

BUY U.S. WAR BONDS AND HOLD THEM!

SMOOT-HOLMAN COMPANY
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA
MADE IN U.S.A.

Offices in Principal Western Cities—Branch and Warehouse in San Francisco

Oscillograph (418)



Allen B. DuMont Laboratories have announced changes in the Type 208 B oscillograph. Improvements include use of mineral oil impregnated, hermetically sealed paper capacitors and increased voltage ratings for certain paper capacitors. Tube complement has been changed to include Army-Navy preferred types. A frequency range adjustment potentiometer has been added. Changes also have been made for greater mechanical ruggedness, it is stated.

Power Booster (419)

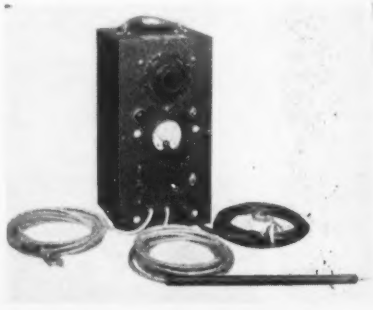
Talk-A-Phone Electronic Laboratories have announced an improved HP-16 power booster, which permits a regular intercommunication system to become a paging system. This unit is capable of delivering a minimum of 15 watts "voice range" power; if greater power levels are necessary, more than one booster may be used. Special type speakers also are available. The unit is 6 x 12 x 6¼ in.; operation is on 110 volts a-c, 60 cycles.

Combination Lug (420)

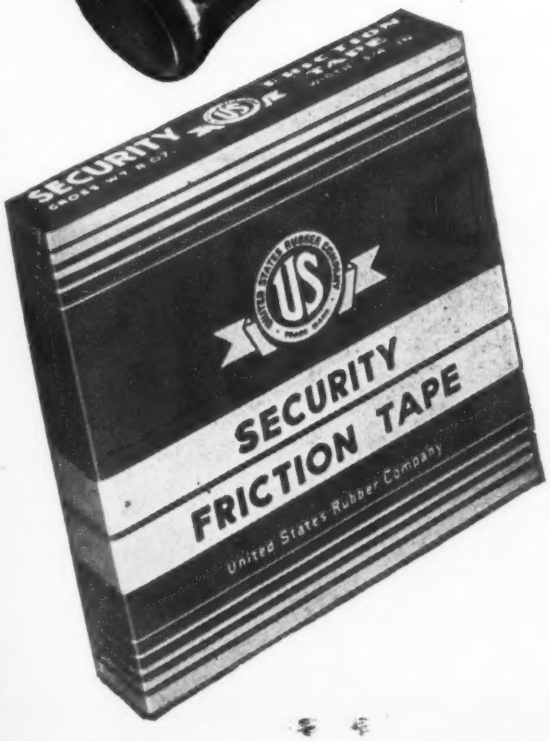
O. Z. Electrical Mfg. Co. has developed a combination connector lug, Type XL, which will accommodate more than one size of wire. It is made of cast copper alloy and is so designed that high clamping pressure is exerted by the pressure plate.

Insulation Tester (421)

A portable insulation tester recently announced by General Electric Co. can be plugged into a 115-volt, 60-cycle outlet and will supply variable test votages from 0 to 2,500 volts. The set has a capacity of 750 va. and will take one-minute loads of 1,500 va. without injury, the manufacturer states. It consists of a dry type step-up transformer, variable autotransformer, indicating voltmeter, air circuit breaker and control switches. Weight is 47 lb.; case measures 15 x 7¾ x 8¾ in.



DON'T FLY OFF THE HANDLE —



Safety Tip: **You know how tough it is to hang onto a hammer when the handle gets smooth and slippery. For a firm, sure grip, just wrap a few turns of Security Friction Tape on your hammer. Then notice how much easier it is on your hand—on your temper. You'll find, too, that Security Tape packs a lot of safety on many other jobs.**

Play Safe — Use Security

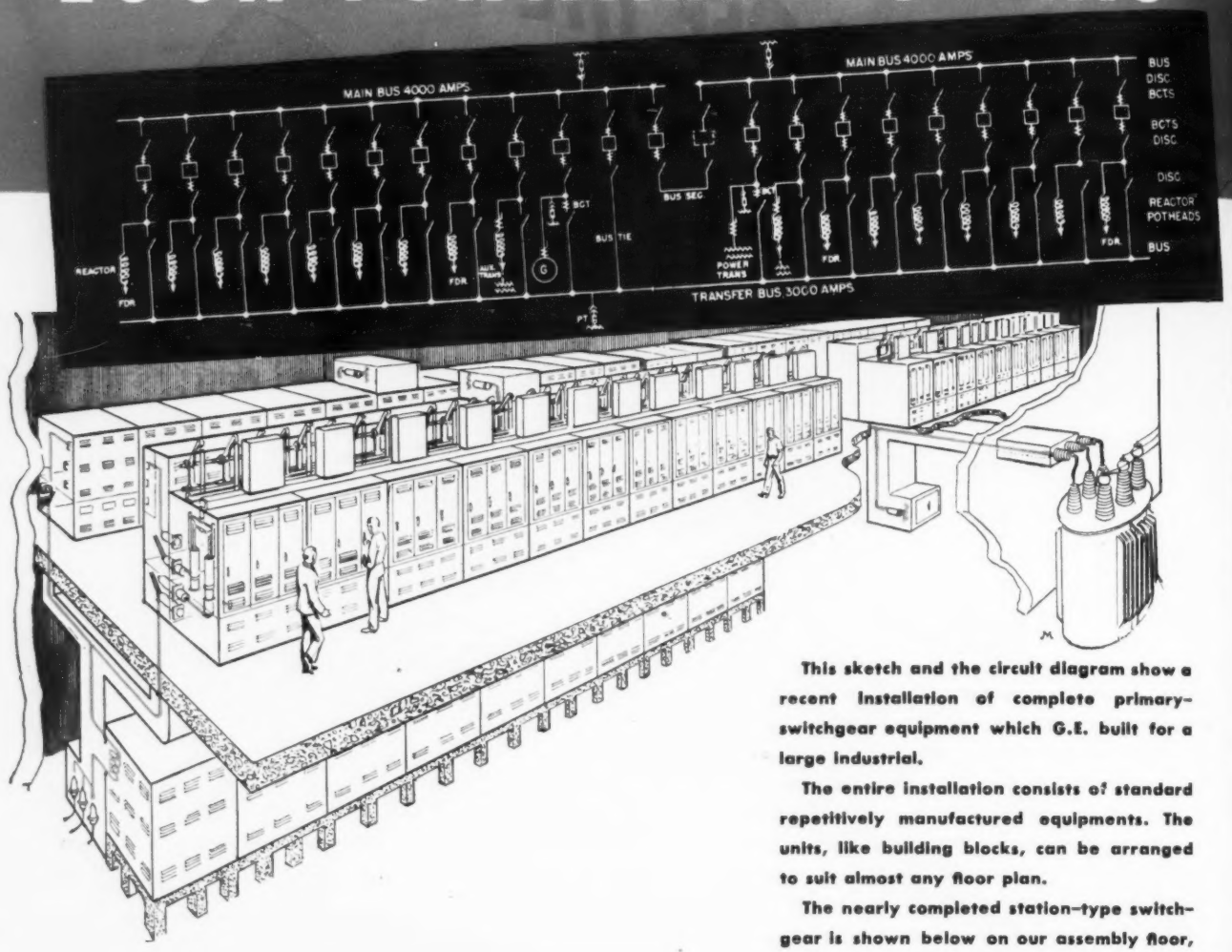
SERVING THROUGH SCIENCE

Listen to "Science Looks Forward"—new series of talks by the great scientists of America—on the Philharmonic-Symphony program. CBS network, Sunday afternoons, 3:00 to 4:30 E.W.T.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

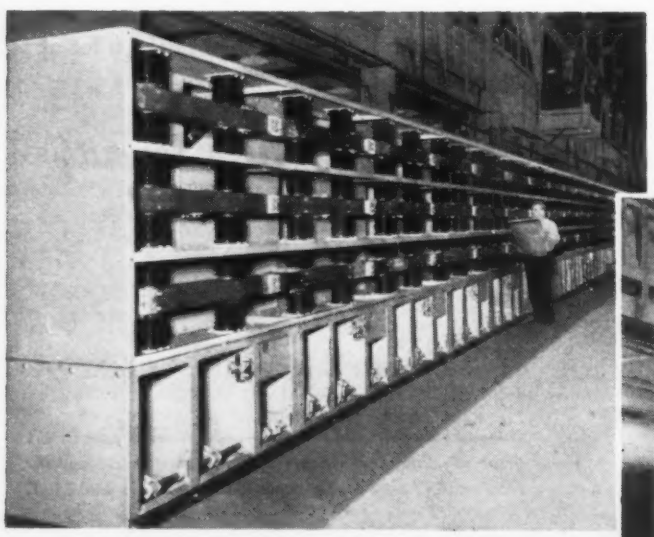
LOOK FORWARD TO THIS

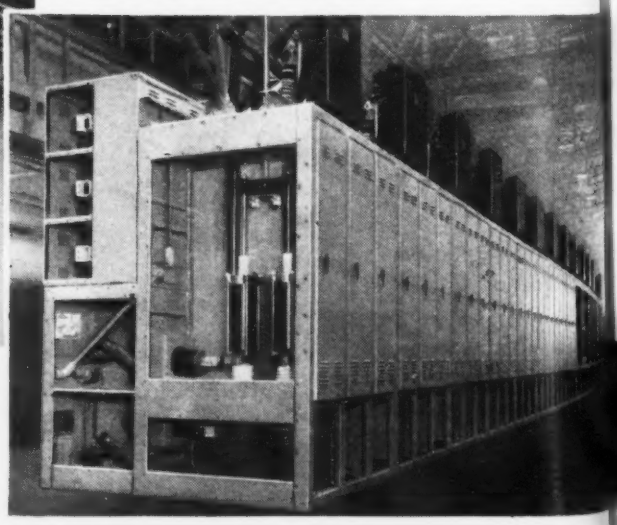


This sketch and the circuit diagram show a recent installation of complete primary-switchgear equipment which G.E. built for a large industrial.

The entire installation consists of standard repetitively manufactured equipments. The units, like building blocks, can be arranged to suit almost any floor plan.

The nearly completed station-type switchgear is shown below on our assembly floor, where we duplicate the actual installation floor plan and test all such assemblies to insure proper co-ordination. The complete equipment is designed with accent on accessibility of all parts for easy maintenance, and must be right both electrically and mechanically before it is shipped.





Metal-enclosed, transfer-bus compartments (left) and FH cubicles (right) in final stages of construction. These equipments contain everything necessary for proper operation—require only metal-enclosed bus-run connections to related equipments and secondary connections to the metering-and-control center.

BUY WAR BONDS

TYPE OF SWITCHGEAR

It enables you to apply your most advanced thinking and do it at the lowest investment cost —

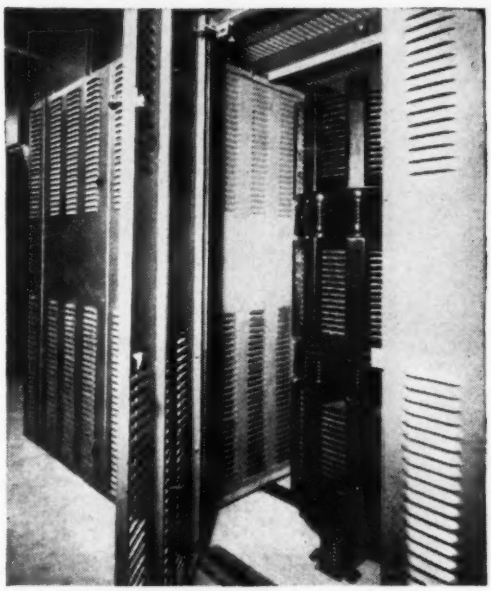
...for a station or even a whole system

THIS metal-enclosed primary switchgear, for circuits up to 33 kv, and with interrupting ratings up to 2,500,000 kva, is so designed that it can be factory-assembled in many standard combinations.

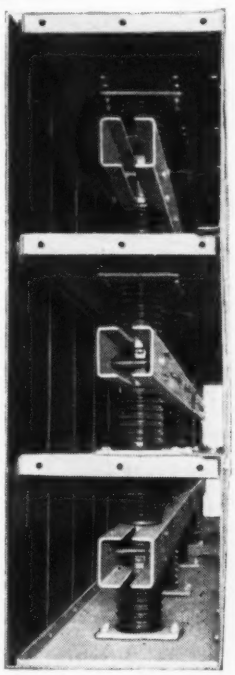
Its versatility enables you to meet almost any circuit arrangement and functional requirement with standard, repetitively manufactured equipment.

The same versatility permits you to make the best possible use of your available floor space. The basic units of equipment can be assembled in such a way, and the equipments so grouped and located, that, usually, major reconstruction or an addition to the building is not necessary. On new construction many purchasers, stimulated by the variety of factory-assembled combinations available, have made important savings by designing the building to fit an ideal arrangement of equipments.

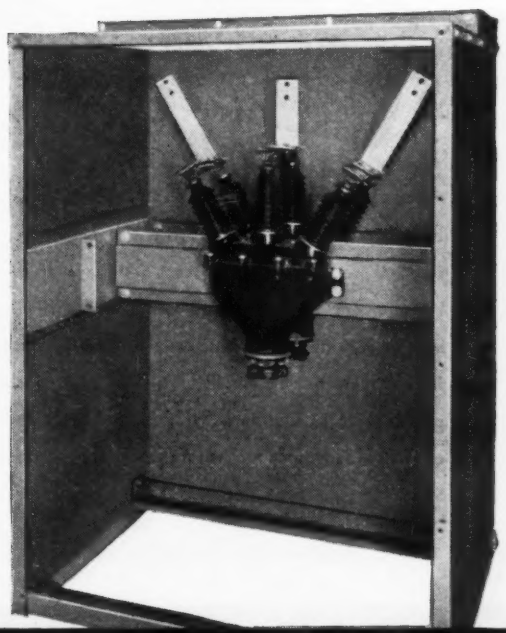
Complete, standard G-E switchgear equipments are available for the high-voltage primary circuits and the low-voltage auxiliary circuits. Whether you are planning new construction or want to modernize an installation, ask your G-E representative how standard switchgear equipments can help you to provide better circuit protection, regulation, relaying, or control. *General Electric Company, Schenectady 5, New York.*



Metal-enclosed feeder-reactor compartments



Metal-enclosed, three-phase bus runs



Metal-enclosed cable-entrance compartment with three-phase pothead

PACKAGED SWITCHGEAR

GENERAL ELECTRIC

8G5-17-7300

From Maine to California, from small villages to great cities, plans are being formulated for improved Street Lighting . . . Some day, perhaps soon, these blue-print projects will have to be put into operation . . . Here in one comprehensive authoritative book are all the answers as to how to obtain the efficient, economical illumination which you have planned for your particular locality. It has been acclaimed as the "Code" for postwar Street Lighting. It is splendidly illustrated and includes a series of actual layouts for traffic arteries, business and residential streets. Send for your copy.

Covers Every Phase of Modern Street Lighting Practice

- Planning and Procedure
- Spacing and Mounting
- Light Distributions
- Typical Layout Practice
- Modernization Plans
- Equipment Recommendations
- Comparative Efficiencies, etc.

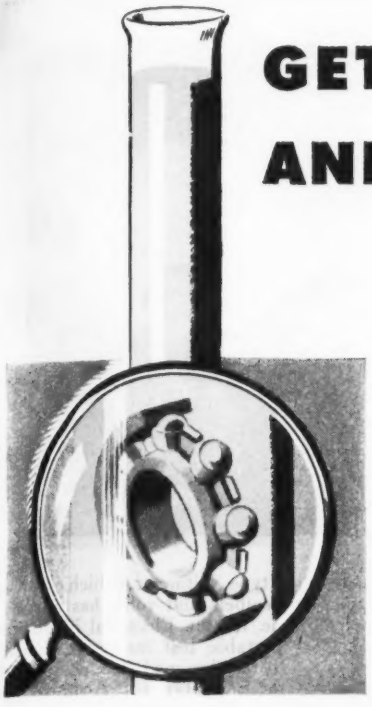
Every Civic Authority should own this Book . . . Reserve your copy today!

HOLOPHANE COMPANY, INC.... *Lighting Authorities Since 1898*

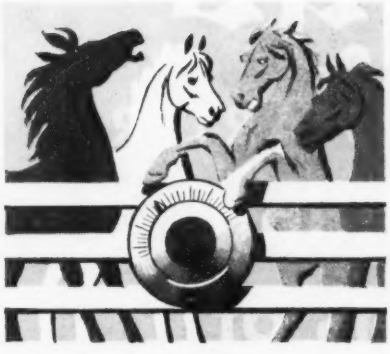
342 MADISON AVENUE, NEW YORK 17 • Holophane Co., Ltd., 385 Yonge St., Toronto, Can.

Pacific Coast Representatives:—R. G. Dummel, San Francisco; F. van Gilluwe, Los Angeles
Distributors, General Electric Supply Corp.

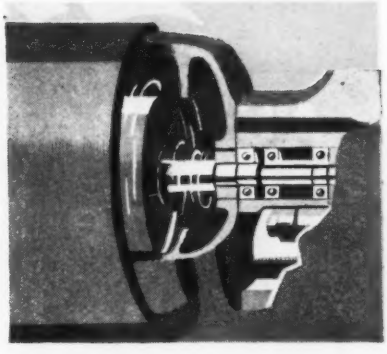
GET SAFETY FOR BEARINGS AND PEAK PRODUCTION TOO



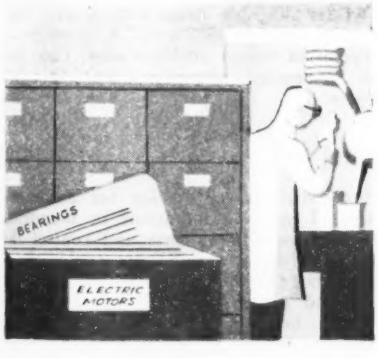
1 BALLROLL is a bearing grease made especially by Union Oil Company for lubricating electric motor bearings. It effectively seals bearings against moisture, dirt, lint and dust.



2 With all foreign matter locked out, the bearings are as safe as in a bank vault. In addition, you can be sure of getting peak production because BALLROLL enables your motor to develop its maximum horsepower.



3 BALLROLL is a short-fibered grease with a very low torque. It sheers easily and quickly, permitting the motor shaft to turn with least resistance. This elimination of drag allows the motor to develop its full speed.



4 The development of BALLROLL is typical of the care and research with which Union Oil Company—maker of 492 quality petroleum products—investigates and solves the lubrication problems of industry.

You can get BALLROLL in three grades —extra light, light, and medium. All three will keep your bearings safe from excessive wear at peak production.

Order a supply of BALLROLL now by phoning your local Union Oil representative.

BALLROLL

UNION 76

Another **UNION OIL** *Success-Tested Product*

In Thousands of Factories

Lloyd

AUTOMATIC STARTERS are lighting the lights of Industry

Fewer Service Interruptions
Longer Life for Lamps
Longer Life for Ballasts

They're fully automatic. They lock out and reset without touching the starter. Just remove defective lamp and insert a new one after turning off the current. Then turn on the current. The lamp lights automatically.

LOOK FOR THIS STARTER
IN THE RED PLASTIC CAN

LLOYD PRODUCTS CO.

Dept. EW-4 Providence 5, R. I.

Voltmeter (422)

A rectifier type voltmeter, which provides readings in decibels and volts, has been developed by the Weston Electrical Instrument Corp. This portable test instrument, Model 695, Type II, is designed for power level measurements in all types of sound equipment and in radio receivers and for a-c voltage measurements from 2 to 200 volts full scale.

The tester is a medium-speed instrument, with moderately damped movement, and has a constant impedance of 20,000 ohms. Eleven db ranges are provided, from —4 to +36 at zero on the db scale; and seven a-c ranges from 2 to 200 volts are available. A self-contained condenser is provided for blocking d-c component. The instrument is calibrated for 500-ohm lines with a zero level of 6 milliwatts or 1,732 volts. A chart giving interpolation values on lines other than 500 ohms is supplied. Dimensions are 5½ x 3⅝ x 3⅛ in.

Control (423)

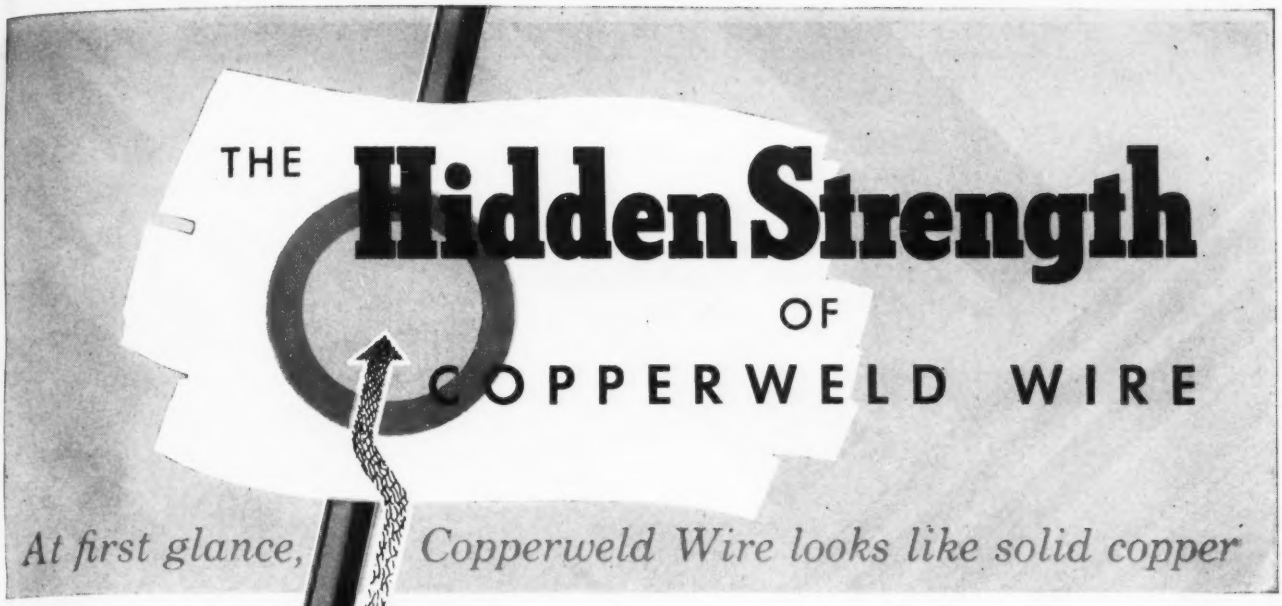
Photoswitch has a device for automatic control of pouring operations in foundries. It can be used to indicate and control the density of gases as well as turbidity in liquids and can distinguish between a clear liquid and air above it, or can detect an interface between two liquids differing slightly in translucency. This control, type A20C, operates from a supply of 115 volts a-c, 60 cycles and incorporates a single-pole double-throw relay for normally open or normally closed operation. Relay contacts are designed to handle 10 amp. a-c or 5 amp. d-c.

Redesigned Fitting (424)

Redesign of its No. 1517AT adapter fitting has been announced by the Wiremold Co. Ears have been provided for fastening the fitting to the wall rather than to the floor, eliminating necessity for drilling and plugging concrete or composition floors for screw fastenings.

Rural Transformer (425)

Type SRO 1-kva. oil-filled units for rural service have been added to the Standard Transformer Co. line. This transformer is designed to operate on a grounded neutral system at voltage ratings of 7,200/12,470 Y or 7,620/13,200 Y.



THE **Hidden Strength** OF COPPERWELD WIRE

At first glance, Copperweld Wire looks like solid copper

BUT LET'S TAKE A LOOK INSIDE

... Here, hidden from view, but always on the job, is a high strength alloy steel core. This gives Copperweld strengths from 120,000 to 180,000 pounds per square inch, making it the ideal conductor for long spans and for many applications where high strength, conductivity and corrosion resistance are required.

Because Copperweld consists of a thick protective layer of pure copper molten welded to an alloy steel core, this wire has the best electrical conductance of any high strength conductor and greater tensile strength than any wire of comparable electrical properties. So when you need top performance in power conductors, wire, strand and ground rods—specify Copperweld.

Copperweld

RODS · WIRE · STRAND

ARMY NAVY

COPPERWELD STEEL COMPANY, GLASSPORT, PA.

Pacific Coast Representative: C. E. INGALLS · RIALTO BUILDING · SAN FRANCISCO, CALIFORNIA

COUNTER
COUNTER
COUNTER
Increased production facilities make possible early delivery on additional orders for the following insulations — which continue to be essential to the war effort.
VARNISHED CAMBRIC AND TAPE
VARNISHED FIBERGLAS
ALTERNATES FOR VARNISHED SILK
VARNISHED PAPERS
SLOT INSULATIONS
INSULATING PUNCHINGS
VARNISHED TUBINGS AND SATURATED SLEEVINGS
EXTRUDED PLASTIC TUBINGS
WIRE MARKERS
FIBRON PLASTIC TAPES
INSULATING VARNISHES
For information, write Department 106
STANDARD OF THE WORLD
IRVINGTON INSULATION
TRADE MARK
IRVINGTON VARNISH & INSULATOR COMPANY
IRVINGTON 11, NEW JERSEY
PLANTS IN IRVINGTON, NEW JERSEY AND HAMILTON, ONTARIO, CANADA

How many occupations in this picture?

There are no tricks—no hidden faces. Just see how many ordinary, every-day occupations you can find. Count 'em before you check the answer in the tiny type below.*

Whatever the number, it's a pretty safe bet that *all* these occupations—and many more—are represented among the folks who own your local electric light and power company.

Housewives and farmers lead the stockholder lists of most such companies. But there are plenty of nurses and doctors, teachers and mechanics, secretaries and salesmen, too.

There are several million of these *direct* owners—and you may be among them.

Certainly you are included among the *indirect* owners, if you have a savings account or life insurance policy. When you make a deposit or pay a premium, the money isn't just stuffed in a strong-box and left there. It's put to work earning a profit for *you*—a profit called "interest."

Banks and insurance companies invest your money carefully. They put a large proportion of it into electric light and power securities—because these companies have proved their basic soundness over the years by dependable service and good *business* management.

So the electric industry is probably the most widely owned industry in America. Almost every American has a stake in it. *And what helps the industry helps you.*

167 ELECTRIC LIGHT AND POWER COMPANIES

SELF-SUPPORTING, TAX-PAYING BUSINESSES

* Names on request from this magazine.

*The artist—who ought to know—says there are 44.

* HEAR NELSON EDDY IN "THE ELECTRIC HOUR," WITH ROBERT ARMBRUSTER'S ORCHESTRA. EVERY SUNDAY AFTERNOON, 4:30, EWT, CBS NETWORK.

How to get fun out of a fact—and vice versa

The advertisement shown here throws new light on the old myth that the electric business belongs to Wall Street.

It's a picture puzzle, but there's nothing puzzling about the point it makes—*that the real ownership of the electric industry goes right down into Main Street . . . to you and you and you!*

This advertisement appears in national magazines during April. It is part of a public information program, now in its fourth year, which has aroused wide interest and enlisted more and more *business*-managed electric companies.

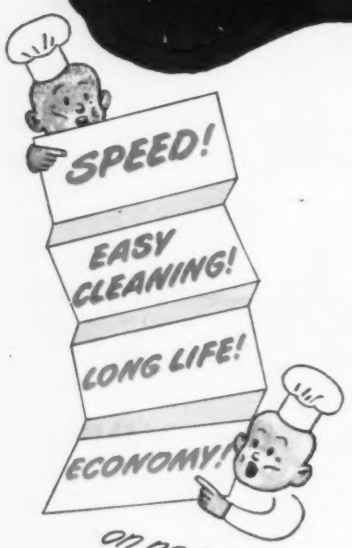
Similar advertising in magazines, farm publications and newspapers is backed by the powerful force of radio—"The Electric Hour" featuring Nelson Eddy — every Sunday afternoon, 4:30, EWT, over CBS.

Tune in this program regularly. read the advertisements as they appear, and tell your friends about them. *What helps your industry helps you.*

167 ELECTRIC LIGHT AND POWER COMPANIES*

SELF-SUPPORTING, TAX-PAYING BUSINESSES

* *Names on request from this magazine.*



POSTWAR COOKS WILL WANT THE BEST

Chromalox superiority is the result of twenty-five years continuous research and engineering in electric heating and cooking.

CHROMALOX DESIGN FOR BETTER COOKING

Cross section of Inconel sheathed tube shows how Chromalox provides maximum cooking contact surface.

Famous Chromalox Tubulars will soon again be available. Chromalox Superspeed and Heatflo—to fit any range—are available now.

Edwin L. Wiegand Co.

7540 Thomas Blvd., Pittsburgh 8, Pa.

Montgomery Bros., 420 S. San Pedro St., Los Angeles, Calif., 2333 N.W. Westover St., Portland 10, Oregon, 61 Fremont Street, San Francisco 5, Calif., 911 Western Ave., Seattle 4, Wash.; **The Peterson Co.**, 1921 Blake St., Denver 2, Colorado

on new ranges and for replacements

CHROMALOX

RC 3

Means Electric Cooking at its Best!

BULLETINS

data books, etc.

Steam Plant Planning (426)

A steam power plant planning guide has been prepared by Westinghouse for installations from 10,000 to 60,000 kw. The 40-page publication has two parts. Part 1 illustrates types of turbines and charts turbine sizes and speeds. Part 2, on performance data, covers basic operating conditions, including effect of deviation in pressures and temperatures on heat rates; regenerative feed-water heating; recommended condenser sizes and dimensions; condenser friction; impeller, propeller and axial type circulating pumps; condensate pumps.

Resistance Meter (427)

Bailey Meter Co. has a new bulletin on its electronic resistance thermometer. This bulletin gives information on ranges, power supply required, speed of response, accuracy, sensitivity, installation, standard chart ranges, automatic control application, alarm contacts, temperature sensitive elements and measuring circuits.

Germicidal Lamps (428)

A folder on germicidal lamps and fixtures is being distributed by the Edwin F. Guth Co. Prepared to answer frequently asked questions about these lights, the folder tells what they do, shows fixtures for wall, ceiling and floor mounting and gives layout data and instructions. Illustrated.

Ceramic Insulation (429)

A 12-page bulletin on mica ceramic insulation has been prepared by Electronic Mechanics Inc. Electronic parts are shown in this publication, which also lists properties and gives application data. Tables and charts list electrical, mechanical and physical properties on various grades.

Lighting Equipment (430)

Data on incandescent and fluorescent lighting equipment manufactured by the F. W. Wakefield Brass Co. is contained in a 28-page booklet recently released. Equipment illustrated and described is for office, drafting room, school and store lighting.

Test Instruments (431)

A folder describing its test instruments has been issued by Weston Electrical Instrument Corp. Included are testing sets for servicing electronic equipment, testers for laboratory, manufacturing and maintenance requirements.

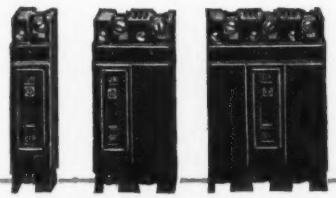
Electronic Heating (432)

Electronic heating equipment is described in a 16-page bulletin published by Scientific Electric. Development of the operation, two basic methods of applying electronic heat, and applications are treated. Illustrated.

TRUMBULL

"AT" CIRCUIT BREAKERS

ANYBODY CAN *STOP* TRAFFIC . . IT TAKES A TRAINED MAN TO KEEP IT *MOVING* . . .



One, Two and Three Pole Type "AT", 50 amp. frame Circuit Breaker Units.

Like the trained traffic cop, Trumbull "AT" circuit breakers automatically detect the threatened traffic block on your Electrical highways and take immediate action to prevent trouble. A thermal trip senses momentary overloads . . . and passes them on without interruption. Yet when heavy overloads or short circuits threaten, the multiple common trip-bar INSTANTLY "Quick-Breaks" the circuit on all poles.

TYPE "AT" CIRCUIT BREAKER UNITS AND APPLICATIONS

FRAME SIZES 50, 100, 225, 600 AMPS. 250V. DC; 600V. AC

Safe, Simple, Dependable "AT" Units Are Featured in All of the Following Trumbull Equipment

Enclosed Industrial Circuit Breakers — furnished also in special enclosures, including explosion-proof.
Circuit Breaker Panelboards
Circuit Breaker Switchboards
Circuit Breaker disconnects in Combination Magnetic Starters
Circuit Breakers in Control Center units

- Provide Automatic overcurrent and short circuit protection.
- In moulded phenolic case — dead front — sealed to prevent tampering.
- Common trip—all poles open on overload or short circuit on any pole.
- Solderless connectors — ratings clearly imprinted on handles—arc quenching chamber — toggle mechanism — quick make, quick break — tip free.

Illustrated and described in Trumbullaid Circulars Nos. 314, 315, 318, 321, 330 and 333 available on request.

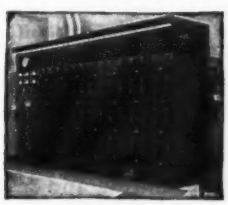
FOR INDUSTRIAL USE

Type "AT" Enclosed Industrial Circuit Breakers. Also Available in cast iron Explosion-proof enclosures for hazardous locations.

IN PANELBOARDS

"AT" Circuit Breaker heavy duty distribution panelboards for light and power. Also "NAB" lighting Panelboards.

IN SWITCHBOARDS



Typical Circuit Breaker Switchboard containing "AT" breaker units.

THE TRUMBULL ELECTRIC MANUFACTURING CO.

A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O.
SEATTLE — SAN FRANCISCO — LOS ANGELES

PLAINVILLE, CONNECTICUT

General Electric *Presents* the 250-Watt FM Station Combination

FOR RADIO SUPERVISION OF SYSTEM MAINTENANCE

• *provides maximum 2-way communication range*

FOR central dispatching headquarters, General Electric offers the 250-watt FM radio station combination for installations where coverage of an extensive area is required.

● This station combination is a complete FM headquarters unit incorporating all transmitting and receiving facilities. It is capable of maintaining reliable 2-way radio communication over exceptional distances throughout your circuit mileage, under the severest conditions day and night—and with remarkable freedom from static and interference.

● The G-E FM station combination includes • a transmitter rated at 250 watts and capable of delivering, conservatively, a power output of 350 watts at any frequency in the 30- to 40-megacycle band • a heavy-duty transmitter power supply • a highly sensitive station receiver capable of reproducing intelligible messages down to the fringe of usable signal strength • provision for use of the G-E deluxe remote-control unit so that the entire station combination may be installed at the best location for maximum range and coverage.

● For additional information on the G-E 250-watt FM station combination, and on General Electric's complete line of 2-way FM communication equipment, call your G-E sales engineer. *Electronics Department, General Electric, Schenectady 5, N. Y.*

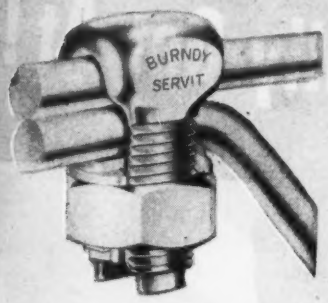
Government regulations now permit new installations of 2-way FM radio for important requirements of utility companies. Your G-E representative will help prepare your application.

Hear the G-E radio programs: *"The World Today" news, Monday through Friday 6:45 p. m., EWT, CBS. "The G-E All-Girl Orchestra," Sunday 10 p. m., EWT, NBC. "The G-E House Party," Monday through Friday, 4 p. m., EWT, CBS.*

Everything for 2-Way Radio Communication

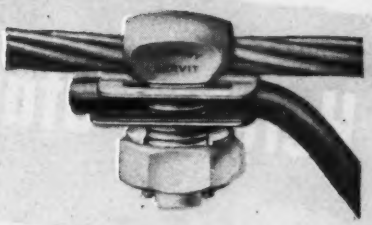
GENERAL ELECTRIC

163-DB-6918



SERVIT (Type KS) Forged for High Strength. For copper and Copperweld conductors. 13 sizes take from No. 10 solid to 1000 Mcm. Also available in aluminum.

BUTTIN (Type KP) Compact, inexpensive; ideal for making connections between service drop conductors and entrance leads.



SERVIT (Type KSAKF) For aluminum to copper connections. Consists of High Strength aluminum Servit with bimetallic Copral washers to keep similar metals in contact.

Connectors for Overhead Distribution

Rural or Urban

Burndy *makes them all* . . . in sizes and types for every rural or urban overhead need . . . for either copper or aluminum conductors. All provide the high strength, corrosion resistance, electrical efficiency, and the installation ease essential for efficient, low-cost overhead service. Catalog gives complete description. Send for your copy . . . Burndy Engineering Co., Inc., 107-L Bruckner Blvd, New York 54, N. Y.

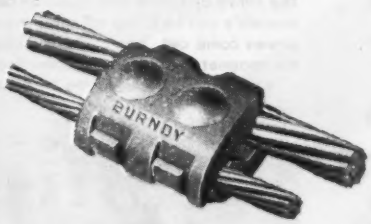
Headquarters for CONNECTORS

Burndy

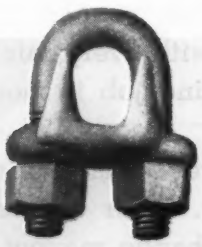
In Canada: Canadian Line Materials, Limited, Toronto 13.
Foreign: Philips Export Corporation, 100 E. 42nd Street, New York 17, N. Y.

REDHEAD (Type HR) Completely insulated live-line jumper clamp for use in pairs with a flexible connecting cable for shunting equipment.

HOTTAP (Type HTE) A well balanced hot-line tap for low-cost work. Eye-bolt fits standard hot-line sticks. Available for copper or aluminum conductors. Also heavy duty types.

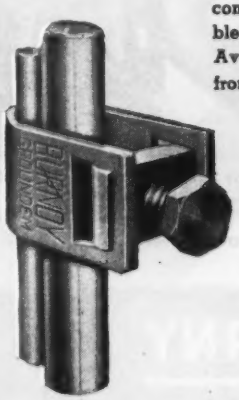


UNIVERSAL CLAMP (Type UC) Accommodates a large range of cables and wires in either groove. Available in 6 sizes to handle from No. 6 solid up to 1000 Mcm.

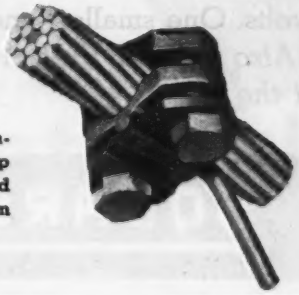


CLIP (Type BC) Bronze Clips for dead-ending work. Available in 9 sizes, for copper wire sizes No. 4 to 750 Mcm . . . and guy wire sizes ¼" to 1".

TAP CONNECTOR (Type KVS) Strong, compact, quickly installed. Multiple bolts for high contact pressures. Five sizes take from No. 4/0 Str. to 1000 Mcm.



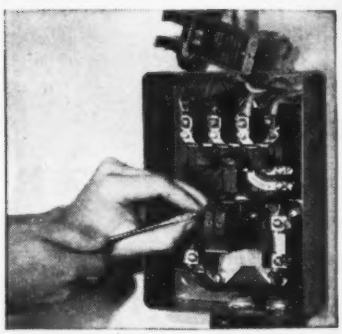
GROUNDEM (Type GH) An economical, non-corrosive ground clamp for driven rod or pipe. Slipped over top of rod or installed from the side.



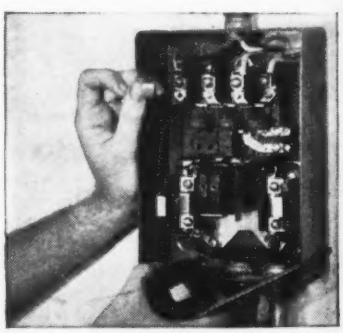
ARMOR ROD CLAMP (Type BPG) For tapping from a run of ACSR protected by armor rod. Has heavy spring plate to keep conductors under constant pressure.

Here's a Starter You Can Really Get At!

Loosen two screws and the arc chamber cover comes off. You can inspect every contact surface at a glance.



The entire armature and movable contact assembly can be lifted off after two more screws come out. You can easily slip off the magnet coil after disconnecting two wires from its screw type terminals.



Contacts are attached with separate screws—you can remove or replace them without disturbing any wiring—and a screw driver is all you need.

Peak operating efficiency and long life of electric motor starting equipment depend largely upon regular inspection and occasional servicing. Today, with every minute at a premium, this inspection and servicing job is more important than ever.

The complete accessibility of Square D starters means faster, easier inspection and servicing. Their simple construction enables the electrician to exchange magnet coils, contacts or overload relays in practically no time at all—using only a screw driver.

Write for Catalog Bulletin 8536 which describes Square D's complete line of A.C. magnetic starters. The starter illustrated is Size I for 3 phase motors up to 5 HP. at 220 volts or 7½ HP. at 440 volts. One smaller, and three larger sizes are also available. *Also ask for SQUARE D's NEW DIGEST #129—just off the press.*

SQUARE D COMPANY

LOS ANGELES 21 • SAN FRANCISCO 3 • SEATTLE 1 • DENVER 4 • DETROIT 11 • MILWAUKEE 2

In the great jobs of wiring that will follow Victory, electrical engineers, competent contractors and their licensed craftsmen will achieve the utmost satisfaction by using products soundly engineered for the job. The National Electric System of wires, cables and raceways, which is designed far above minimum safety requirements, insures long life, faithful service, facility in installation. Be sure you know the complete National Electric System, so you will be well prepared for post-war electrical planning. Write for a free copy of our 350 Page Engineering Data Book.

NATIONAL ELECTRIC PRODUCTS
WIRING SYSTEMS
WIRES AND CABLES

Conduits
Surface Raceways
Wires and Cables
for every electrical purpose

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

WHAT IF YOU HAD TO KEEP TRACK OF THEM ALL

The 6750 manufacturers of electrical products, components and accessories, make untold millions of items for the electrical industry.

Their catalogs present a bewildering variety of types, uses, sizes and prices.

To help you pick and choose what's best for your job is one reason why electrical wholesalers were born.

These wholesalers make it their business to help you in two ways:

(1) To recommend and supply you with standard electrical materials.

(2) To keep you posted on new developments in the industry—improved designs, and short cuts that make construction work more profitable and maintenance and repair jobs easier.

Why not set up a working relationship with your local wholesaler. Profit by his personal attention to *all* your electrical needs.

All T&B products are distributed exclusively through the service organizations of T&B Electrical Wholesalers.

The Thomas & Betts Co., Incorporated
103 N. Santa Fe Avenue
Los Angeles 12, Calif.

The Thomas & Betts Co., Incorporated
542 Natoma Street
San Francisco, California

Paul Douden & Co.
1645 Wazee Street
Denver 2, Colorado

F. A. Strohecker
301 Eyres Bldg.
2207 First Ave., S.
Seattle 4, Washington

T&B
THE THOMAS & BETTS CO.
INCORPORATED
manufacturers of electrical fittings since 1898
ELIZABETH, 1, NEW JERSEY
In Canada: Thomas & Betts Ltd., Montreal

Radio Service Manual (433)

A manual for radio servicemen has been compiled by Sylvania Electric Products Inc. It contains information for adaptation of available tubes to different types of radio receivers so that substitutions can be made; information for battery, 150 ma., 300 ma., transformer and auto tube types; circuit modifications for battery and a-c, d-c sets. Information is tabulated and 36 adaptor circuit diagrams are included for use with the tabulations when changes in tube socket wiring are required. Tabulations are used to indicate the type of changes needed, including filament voltage, filament current, socket wiring, socket type, alignment, top cap connection and changes in bias or plate voltage.

Testing Devices (434)

Industrial Instruments Inc. is offering a bulletin on electrical test instruments, including the direct indicating comparison bridge, capacity and resistance limit bridges, resistance and capacitance decades, Wheatstone bridge, voltage breakdown testers and test fixtures, Kelvin bridge, megohm bridge and megohm meter, conductivity apparatus.

Brushes (435)

Helwig Co. is distributing a new catalogue, No. 245, listing all types of motors and their brush requirements. This catalogue also contains a description of every brush listed, to aid in selection.

High-Voltage Testers (436)

Shallcross Mfg. Co. has prepared a folder on high-voltage test equipment, including portable kilovoltmeters for use from 1 to 30 kv. and corona kilovoltmeters for measurements up to 200 kv.

Ceramics (437)

Ceramics for electrical and other technical uses are the subject of a 32-page bulletin issued by American Lava Corp. Parts are pictured and brief data are given.

Equipment Data (438)

Eliott Co. has issued four bulletins to describe its equipment. One is devoted to its newly developed drive for reducing speed between modern high-speed prime movers and drive shafts for mechanical applications. The second describes the manufacturer's low-speed a-c generators; the third, Type ED low-speed a-c generators; the fourth, low-speed synchronous motors.

Motor Catalogue (439)

A condensed motor catalogue has been prepared by General Electric Supply Corp. Prices, ratings, frame sizes, descriptions are included for the various types. Illustrated.

Freezing Meat (440)

General Electric Consumers Institute is offering reprints of an article, "Freezing Meat" written by Dr. D. K. Tressler and originally published in "American Cookery." This article tells how to handle various cuts and types of meat.

Lighting Data (441)

Publication of a booklet for lighting engineers has been announced by Wabash Appliance Corp. This booklet includes a set of charts giving illumination values based on various spacings and mounting heights; information on maintenance cost and efficiency data.

Insulating Tapes (442)

A catalogue of its Scotch brand insulating tapes has been prepared by the Minnesota Mining & Mfg. Co. This 24-page publication features a chart giving the relative properties of 18 different types of electrical tapes. Samples which may be lifted off for examination are included. Photographs of tape applications, with a description of the operation shown are included in the catalogue, which also illustrates types of dispensers.

Thermostatic Control (443)

A thermostatic control booklet covering equipment for temperatures up to 650° F. has been prepared by Westinghouse. Seven types of bi-metal thermostats for a range of applications are listed, and characteristics and capacities of each unit are discussed. Cross sections, curves and drawings illustrate operation and mounting of units.

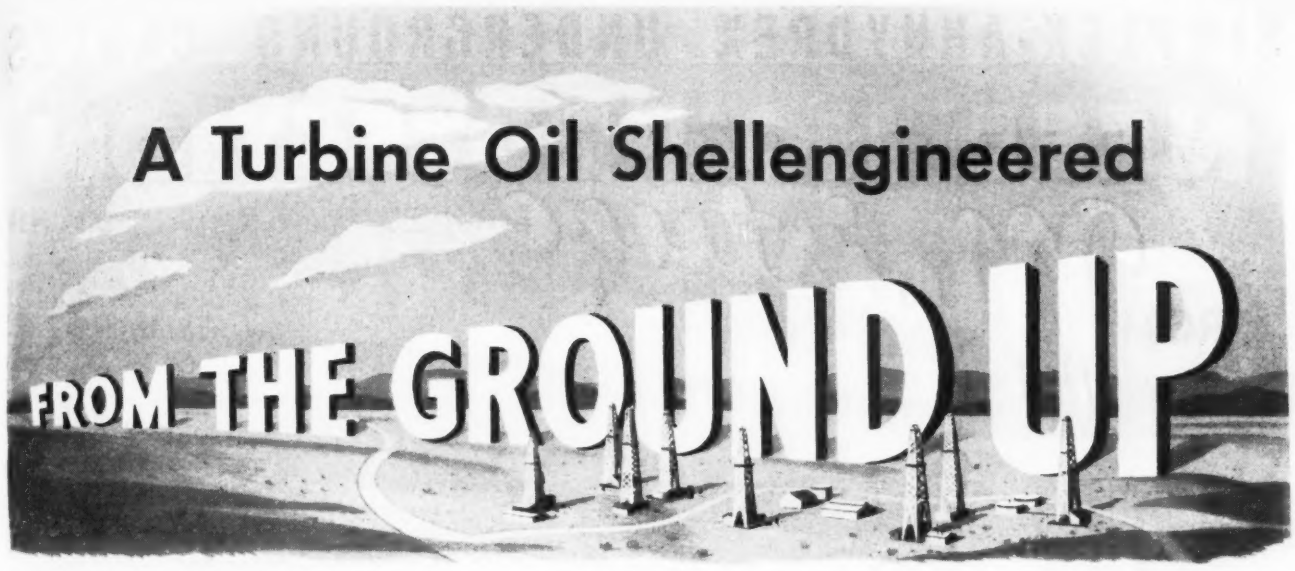
ELECTRICAL WEST, 68 Post St., San Francisco, 4, California
Please send me information about following CIRCLED items:

400	401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420	421
422	423	424	425	426	427	428	429	430	431	432
433	434	435	436	437	438	439	440	441	442	443

Name..... Company*..... Title*.....

Address.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.



Shell turbine oils are especially qualified for turbine lubrication because they are *turbine oils from the ground up* . . . not just ordinary lubricating oils "doped" for turbine use.

BASE —The production of Shell Turbo Oil starts with a careful selection of crude oil known to contain the most desirable properties for turbine lubrication.

REFINING —Next, this "elite" crude is refined by a special solvent extraction process to give it the high stability and excellent demulsibility essential for good performance in turbines.

COMPOUNDING —At the blending stage, Shell Turbo Oil takes on the qualities that have made it famous. For Turbo is fortified with Shell-developed additives . . . special ingredients that have proved Turbo's superiority in both laboratory tests and actual, on-the-job turbine operation.

First, a special anti-oxidant additive is introduced, greatly increasing the oil's naturally high oxidation resistance. Then, to give Turbo its exceptional rust-preventing quality, Shell adds another compound which assures both maximum metal-covering ability and high film strength.

RESULTS —This extra care in selection of crude stocks, refining and compounding pays off for users of Shell Turbo:

Shell turbine oils have shown little or no trace of OXIDATION *after years of service in marine, industrial and public utility installations. They have completely prevented* RUST FORMATION, *resisted* STRUCTURAL BREAKDOWN *over similar periods — far surpassing the performance of replaced oils.*

* * *

For dependable turbine lubrication, rely on Shell Turbo . . . the oil with the anti-oxidation and anti-rust additives. Shell Oil Company, *Incorporated.*

Oil is ammunition . . . use it wisely

SHELL TURBO OIL

Shellengineered for the job

SIMPLEX-ANHYDREX UNDERGROUND CABLES

NEED NO PROTECTION FROM *Moisture*

Underground cables for electrical distribution are exposed to moisture which can cause a lot of trouble and seriously interfere with service. Metallic sheaths will keep moisture out of the cables but they often create other problems of electrolysis, corrosion, sheath losses and maintenance. A flexible, non-metallic covering, such as a rubber sheath, that will not absorb water is the ideal protection.

Simplex-ANHYDREX Underground cables are now made with synthetic insulations and sheaths that are suitable for underground service in ducts or directly in the ground. Exposure to moisture, even permanent submersion in water, has no effect upon their electrical stability. For steady, uniform underground distribution Simplex-ANHYDREX Underground cables are what you need.

Our experience with low water absorption insulations over many years is at your service whenever moisture creates a cable problem for you.

Buna S has replaced natural rubber in Simplex insulations.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex

WIRES and CABLES

How To Be an "ESOFHMBP"*

*Expert Solver of Fractional Horsepower Motor Brush Problems

FIRST you build, staff and equip a complete laboratory for the purpose. Next, make available to it all the experience and knowledge gained from a half century of brush manufacturing. Then, we believe, you can give our type of brush testing service.

Others, it seems, agree. For more and more electric motor manufacturers are submitting their *present* and *postwar* models to our Fractional Horsepower Motor Brush Testing Laboratory for brush recommendations.

Thanks to recent improvements in our manufacturing facilities and methods, speedier deliveries of "National" brushes are now being made. And helping to speed deliveries is this modern laboratory which enables National Carbon Company to recommend brush grades more promptly and accurately than ever before.

We urge you to get in touch with our nearest Division Office for full information on how to submit motors for brush testing under *your own* specified load, temperature, humidity, altitude or other conditions.

The word "National" is a registered trade-mark of National Carbon Company, Inc.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
General Offices: 30 East 42nd Street, New York 17, N. Y.
Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

KEEP YOUR EYE ON THE INFANTRY . . . THE DOUGHBOY DOES IT!

Now ACCURACY IN RUGGED MOVING IRON VANE AND DYNAMOMETER INSTRUMENTS

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25 ~~~

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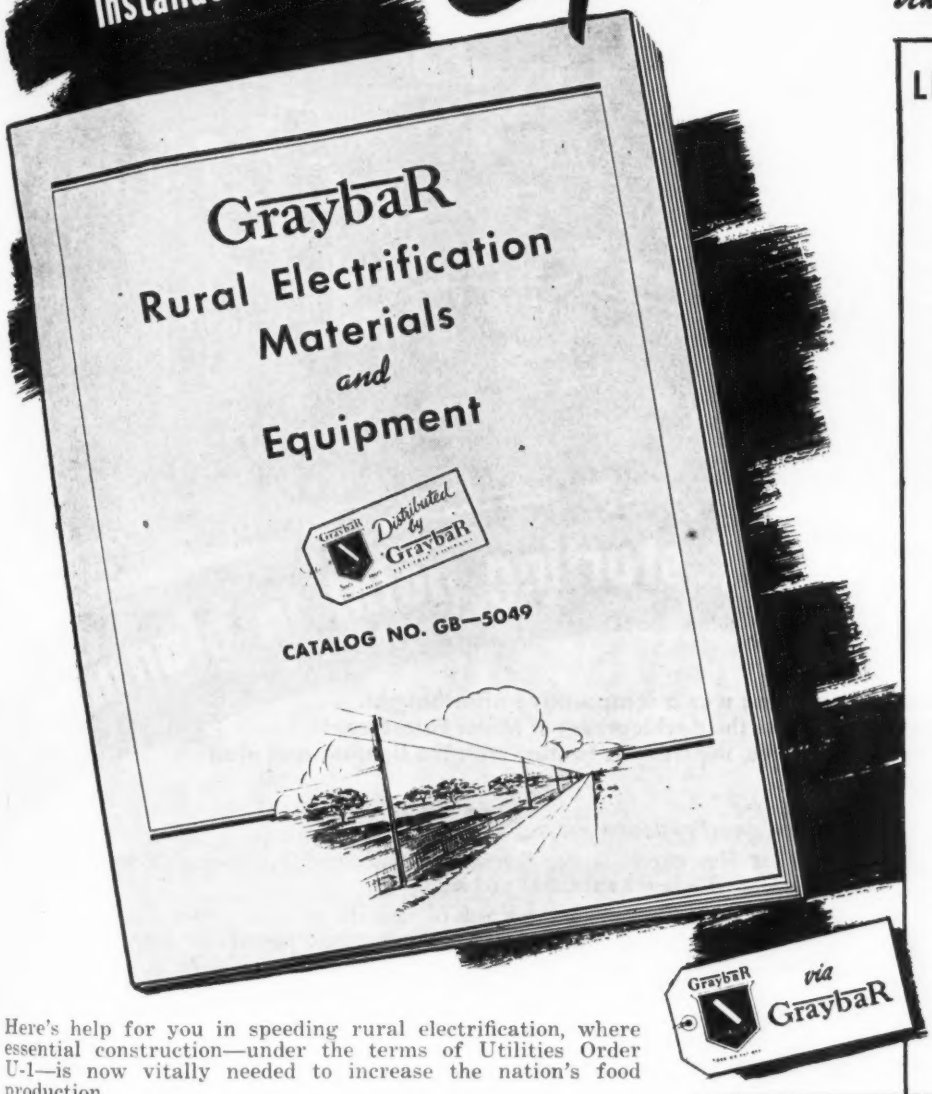

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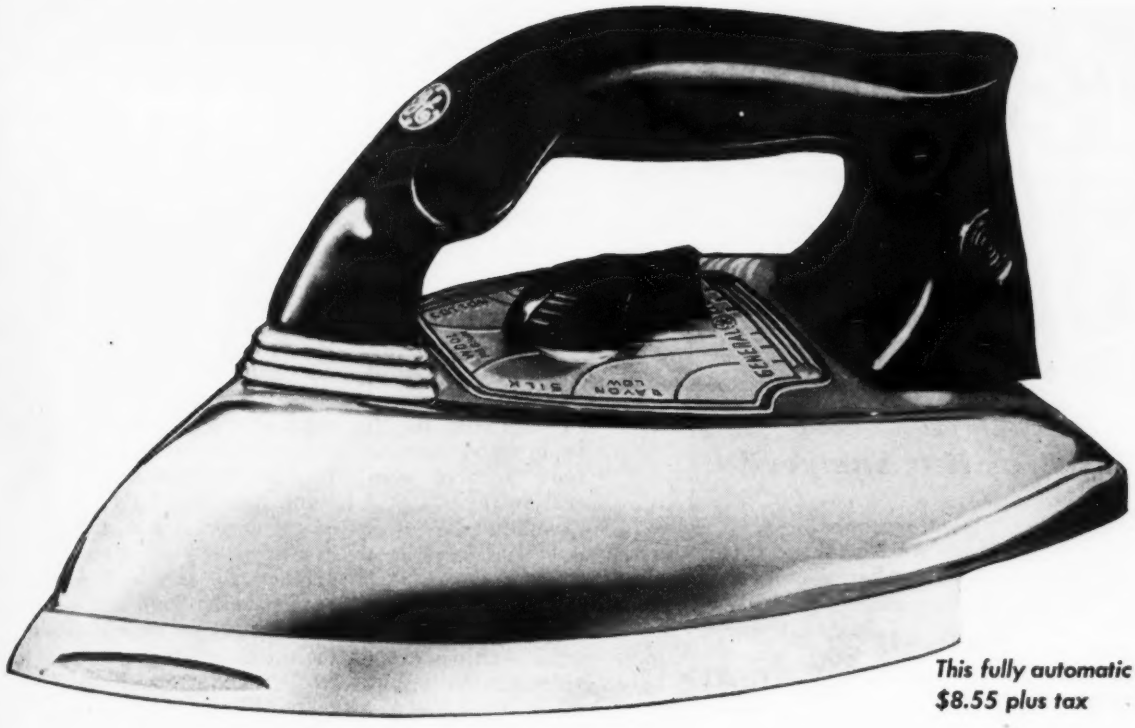

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Is EAA the Answer?

"IN this era of pressure groups, bureaucracy and a virtual labor government, the only alternative for the engineers is to organize," our southern California guest said one evening recently. "Irrespective of how you say some of the conservative members of the profession feel, the engineer won't win any economic gains unless he can exert the same degree of pressure on managements and on government that other groups do. Engineers have found that out down in my section of the state and they are making progress. They are already organized in some of the big aircraft plants and in the city and county offices. Now they are working on organizing the Department of Water and Power in Los Angeles."

"Is it CIO or AF of L?" Electra asked. "Or does it matter?"

"It's neither," our guest replied. "It's the Engineers and Architects Assn. of Southern California, which was started way back in 1894 and never made much progress until somebody realized that the engineers had to have a rallying point if they wanted to get some of the same kind of recognition accorded all kinds of labor, including a lot of skilled craftsmen who were getting more money than the engineers themselves."

"Do you belong?" I asked innocently.

"Hell, no!" he answered heatedly. "Like a lot of engineers who are worrying about this problem, I'm not eligible to join. I'm classed as 'supervisory, with power to hire and fire.' That puts me in the same class as management."

"Would you join, if you were eligible?" Electra inquired.

"I don't know," he said. "In that respect I'm like a lot of engineers who are caught on the horns of this dilemma. If I thought that I might be blanketed into a general CIO or AF of L union with a lot of folks on a much lower employment plane, then I guess I might. That's what most engineers fear about this whole union movement. They are afraid they will be gobbled up by some group totally unsuited to represent them. If that happens they know that instead of seeing their stature and position increased or improved, they'll be brought down to some sort of general average."

"Of course they wouldn't be interested in increased pay?" Electra interrupted, innocently.

"Why not?" he continued. "A lot of engineers have been passed by in the general dishing out of wartime extra pay. They have been frozen or forgotten and they resent it. They are beginning to feel that this is principally because there has been no agency to bargain for them."

"Maybe your southern California engineers have the answer," I opined. "But I'm not convinced."

"You might try writing a substitute formula to get equal results," he said. "Here, read their aims. Here's a copy of their constitution."

I read aloud from the sheet he handed me:

"The purposes and aims of the association shall be:

"(a) To improve the social and economic welfare of technically trained men and women of all branches of engineering, architecture and allied professions.

"(b) To promote the arts and sciences connected with engineering and mechanical and architectural construction by means of meetings for social intercourse and the reading and discussion of professional papers, and to circulate, by means of publication, among its membership, the information thus obtained.

"(c) To promote an honorable appreciation, by the public at large, of the entire technical and scientific group as members of a profession requiring education, experience, skill, judgment, integrity, loyalty and patriotism.

"(d) To develop a grand 'esprit de corps' among all individuals and all branches of the engineering profession whereby a sense of solidarity of interest shall be manifest, not merely to the members themselves, but to the layman as well.

"(e) To bring about a reasonable and adequate remuneration for service performed, recognizing the type of education involved, the experience and skill required, and the responsibility carried.

"(f) To insure the performance of the social duties which the individual and the association owes to the community, be it city, county, state or nation.

"(g) To be an organization of all engineers, architects, scientists and allied technicians.

"(h) To increase employment; to improve the standards of service; to eliminate competitive practices, destructive to the interests of the public, employers and employees; to insure the continuance of well trained engineering, architectural and scientific professions, that the safety and welfare of our country may not be jeopardized; to attract the highest type of men to the professions, and to keep qualified engineers, architects and scientists from leaving the profession for fields more lucrative but less vital to the public welfare and safety.

"(i) To secure for members of the engineering, architectural and scientific professions recognition and adequate compensation for their inventions, discoveries and contributions.

"That's all."

"And that's enough," Electra said. "High sounding set of principles, isn't it?"

"Yes and no," I said. "Any of the top engineering societies would provide most of the same principles and perform the same functions better and more completely."

"When you said 'most' you overlooked the meat of the cocoanut," our guest said. "The most important function of all isn't provided now by your top engineering societies. Virtually all of the activity of the southern California association hinges round provision "e". If you don't think so, you ought to examine a copy of their little publication.

"Listen to this," he said, opening a copy of the paper and reading from it. "'Monthly salary increases ranging from $25 to $107 were granted to all engineering personnel in city service by adoption of an amended salary ordinance by the city council on February 6, 1945, effective April 1, 1945. This culminated six months of sustained committee effort. . . .' And here's more, 'How the city hall section obtained a raise,' and another, 'EAA achieves pay raise for county engineering personnel.'"

"Make you a bet," Electra interrupted. "I'll wager that this EAA has more members in southern California than all of your national engineering societies combined."

If Electra is right, maybe the EAA is the answer.

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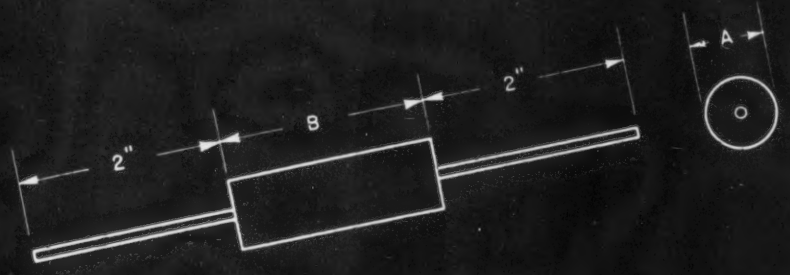

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9A40-1	S-0211	.001	600	3/8	1-3/16
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49A40-3	S-0221	.01	600	7/16	1-3/16
49A40-4	S-0224	.02	600	7/16	1-5/8
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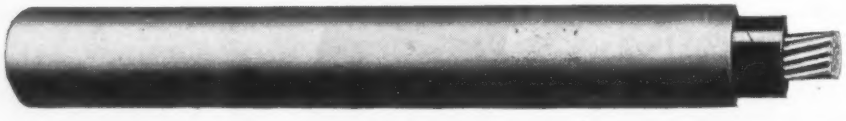

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ELECTRICAL WEST

APRIL, 1945
VOL. 94 NO. 4

Practical Aspects of the Heat Pump

A discussion dealing with possibilities of applying reversed cycle refrigeration equipment to winter heating in cold climates. Outlook is not encouraging, even where summer cooling can be used

F. W. Jordan

Westinghouse Electric & Mfg. Co., Los Angeles

STANDARD refrigeration equipment, designed for summer air conditioning, can be utilized for winter heating by reversing the refrigeration cycle. The idea is not new, novel or impractical. Lord Kelvin, 92 years ago, first called attention to the fact that refrigeration systems are reversible and hence potential heating systems. From the time that the low-cost mechanical refrigerator began to click, the reversed cycle has been studied with keen interest and, as a result, many practical installations have been made.

The heat output of an air conditioning refrigeration system is several times the equivalent of the electrical input to the compressor motor. This characteristic offers possibilities for heating economy equal to, and beyond, anything possible with fuel-burning equipment. Reversing the refrigeration cycle for winter heating provides an all-year air conditioning system that makes the electrical load requirements attractive.

The reversed cycle system, however, has definite limitations as to practical use. Contrary to some inexperienced impressions, it is not a system of air conditioning that will revolutionize the industry, or put fuel-burning equipment in the "horse and buggy" category. To predict the future for reversed cycle air conditioning, a careful study should be made of the practical limitations of this type of heating. The most serious limitation is the availability of a practical source of heat. There are two principal sources of heat available —outside air and water. Well water is the most desirable source of heat, as its temperature is usually equal to the mean average outdoor temperature of the region, and its temperature also is higher than other sources, even in winter. A large amount of heat can be removed from well water in relation to the quantity pumped.

Practical considerations make outside air the most desirable source of heat, as this source is unlimited. However, its temperature is uncertain. When maximum heat is required for winter, the outside air temperature is lowest — thus reducing the heat per unit of air. Because of these limitations, the application of reversed cycle will favor localities where cheap water of favorable temperature is available, or where the minimum outside air temperature is 30°F., or above.

The basic principle of reversed cycle heating is simple. Heat is obtained from air or water by refrigeration. A refrigeration system is a heat pump, wherein heat is absorbed at low temperature in the evaporator and rejected at the condenser at a much higher temperature. Making heat run up hill, so to speak, depends on the basic fact that boiling points of liquids depend on pressure.

Principle of Heat Pump

In Fig. 1 is shown a simple refrigeration system or heat pump. Low pressure refrigerant vapor is raised to a high pressure in the compressor. Compressing the vapor increases the vapor temperature. The latent heat and heat of compression of the refrigerant vapor is removed at the condenser by passing water or air over the surface, thus transferring heat to the condenser

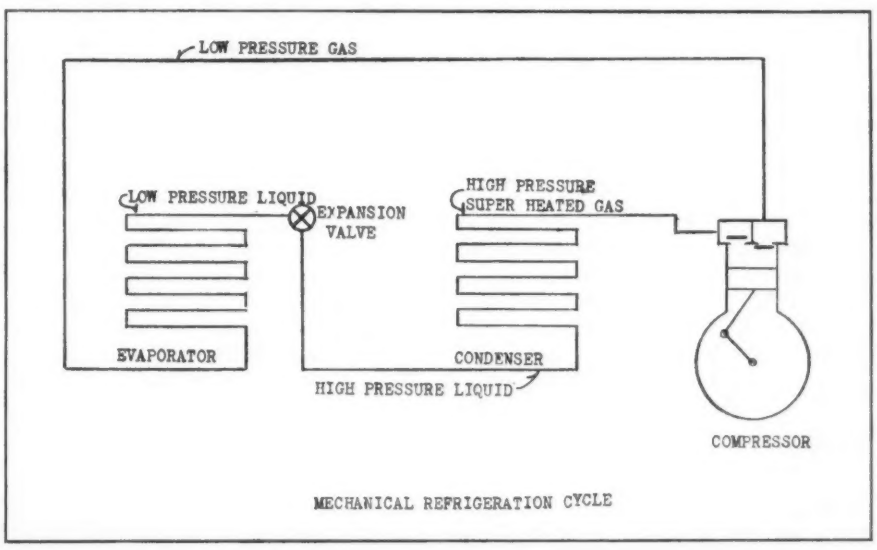


Fig. 1—Schematic elementary diagram of the mechanical refrigeration cycle

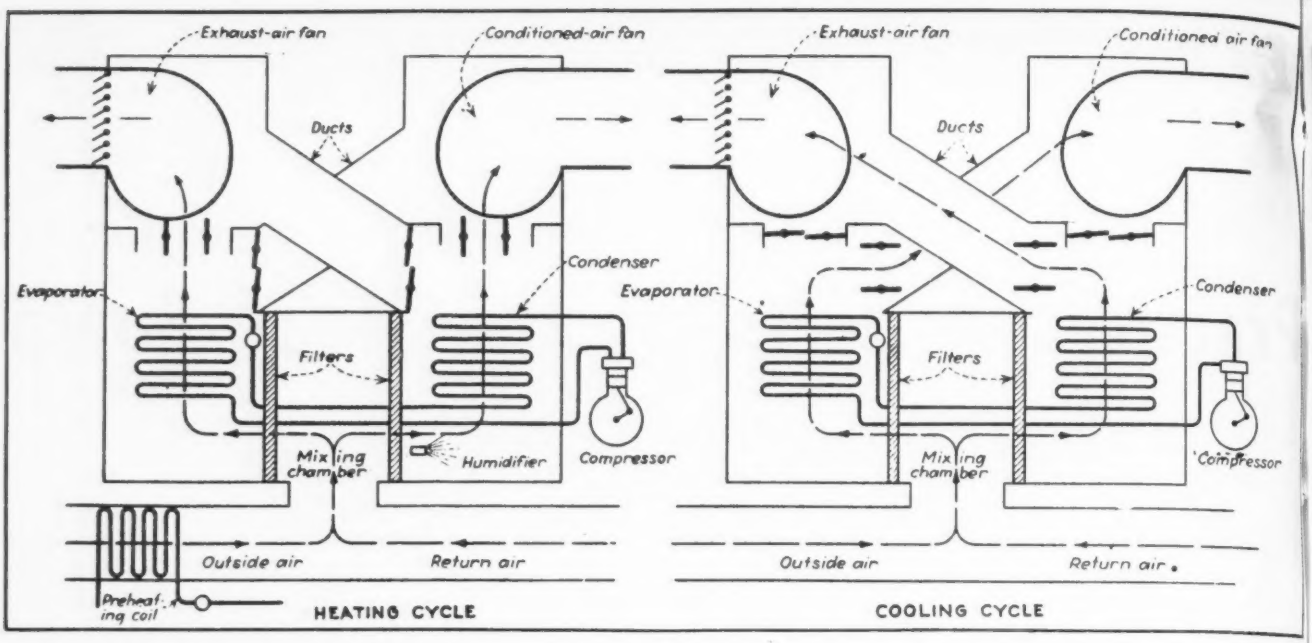


Fig. 2—Schematic diagram of air type reversed cycle air conditioning system

coolant. Removing heat from the high-pressure vapor changes the vapor to a high-pressure liquid. Liquid from the condenser next passes through an expansion valve which lowers the pressure, making it possible for the liquid to boil or vaporize at a lower temperature. The low-pressure liquid enters the evaporator and the latent heat needed to change the liquid to a vapor comes from the air or water passing over the evaporator surface. Heat transferring from the air or water to the refrigerant changes the state of the refrigerant from a liquid to a vapor. The low-pressure vapor then returns to the suction side of the compressor and the cycle is repeated.

Heat absorbed in the evaporator is the refrigerating effect. Heat rejected in the condenser is the refrigerating effect, plus the heat equivalent of the work done at the compressor.

The efficiency of a refrigeration system is termed the coefficient of performance. This coefficient is found by dividing the heat absorbed in the evaporator by the heat equivalent of the mechanical work done at the compressor. This gives a value greater than one. The coefficient of performance depends upon the evaporator temperature and condensing temperature. For example, if the evaporator temperature is 35° and the condenser temperature 70°, the theoretical coefficient of performance would be approximately 17. The coefficient of performance, based on present-day equipment and economic considerations for the same temperature, would be approximately 5. It is quite obvious, therefore, that the heat pump has very attractive possibilities.

In the conventional air conditioning system designed for summer conditioning, the refrigeration system pumps heat out of the building to maintain comfort conditions. The same refrigeration system can, with comparatively simple modifications, heat the building for winter conditioning.

Basic Types of Systems

There are two fundamental types of heat pump systems. One type uses outside air as a source of heat and the second type, water as the source of heat. Fig. 2 shows schematically the air type and Fig. 3, the water type. There are in operation many systems of both types. They are similar but with variations in design. No attempt will be made in this article to comment on the various designs of systems, but rather the basic systems, their output characteristics and application limitations will be discussed.

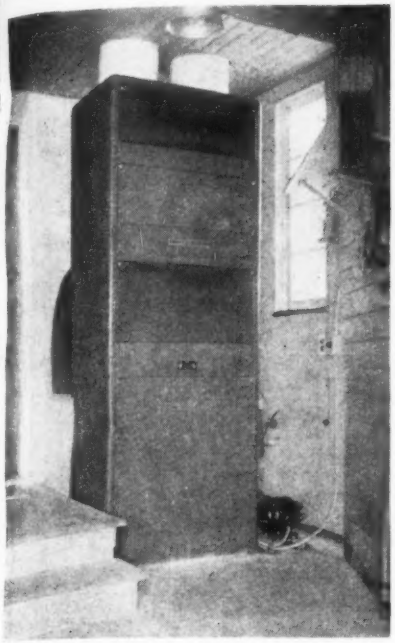
The diagram of Fig. 2 illustrates a typical reverse cycle system using outside air for the heat source. This shows an installation in the office building of the Westinghouse Electric and Mfg. Co., at Emeryville, Calif. The equipment consists of two standard Westinghouse vertical type air conditioning units, two standard Westinghouse 7½ hp. air conditioning compressors, and air dampers.

In the cooling cycle, outside air and return air are mixed in even proportions, dividing into two streams, each passing through filters. One air stream flows over the evaporator coil and, after being cooled and dehumidified, is forced by the conditioned air fan to the duct system supplying the building. The second air stream passes over the condenser coil, and the heat, rejected at the condenser to the air, is discharged to the outside of the building by the exhaust air fan.

When heat is required in the building, it is only necessary to change position of the dampers, which, in this case, is done automatically by a thermostat controlling the temperature in the building. In the heating cycle the air passing over the evaporator is discharged to the outside of the building by the exhaust air fan, and the air passing over the condenser is heated and discharged into the duct system serving the building by the conditioned air fan.

Heat Output Characteristics

Heat output characteristics of the Emeryville installation are shown in Curve 1. The system completely conditions a building 90 ft. long by 50 ft. wide, two stories high, with 6-in. concrete walls. The walls and roof are insulated with 4 in. of redwood bark. The total window area is approximately 1,900 sq. ft. double glass construction. Equipment selection was based on a winter design of 35°, dry bulb outside temperature, and 70° dry bulb inside temperature. Total heat loss for the building is approximately 230,000 B.t.u. per hour. The summer design outside temperature is 85° dry bulb, and 68° wet bulb; inside temperature, 75° dry bulb and 62.8° wet bulb, with total heat gain of 196,500 B.t.u. per hour. Inasmuch as the building construction would be suitable for any locality with a winter outside design of zero degrees or lower, and an outside summer design of 100° or higher, the heat loss of the building and the output characteristics of the air conditioning plant were calculated and extended on the curve for discussion purposes.



Reversed cycle heating and cooling unit in the residence of J. A. Hill of Pacific Gas and Electric Co. Heat is extracted from well water. Compressor motor is 2½ hp.; total connected load, including fan and pump motor, is 3¼ kw. Heat input to the house is 47,000 B.t.u. per hour. Unit has been in successful operation for five years

Equipment selection for summer cooling should be nearly adequate for winter heating, if the capital cost and operating costs of the plant are to compare favorably with a conventional system using fuel burning heating equipment and refrigeration for summer cooling. Where cold winters are common, that is outside design below 30°, the heat output characteristics indicate that the refrigeration plant must be considerably larger than would be necessary for summer cooling the same building.

For example, the equipment in the Emeryville plant was selected for a winter minimum of 35° and summer maximum of 85°. The capital cost of equipment for winter and summer conditioning in this case is slightly less than a conventional system. With an outside temperature of 35° and an inside temperature of 70°, the coefficient of performance of the plant, including the electrical energy necessary for the fans, is approximately 3.4. With this coefficient of performance, the cost of electrical energy for winter heating compares very favorably with natural gas or oil at prevailing rates. As the outdoor temperatures rise, the coefficient of performance of the plant increases, so that better economies are obtained at the higher outdoor temperatures. The average kilowatt-hour consumption for the building for the year 1939 was approximately 4,500 kwh. per month. Maximum consumption occurred in July (4,790 kwh.) and minimum in December (2,990 kwh.)

Assume the Emeryville building and installation in a locality with the outside winter design 10° and summer design 100° The cooling capacity of the plant is sufficient to maintain 80° inside, but the heat output would fall short. Note that the heat loss of the building would be 400,000 B.t.u. per hour, and the heat output of the plant 185,000 B.t.u. per hour. The coefficient of performance of this type of system drops with a corresponding drop in outside temperature, so that, regardless of design, the capacity of the refrigeration plant for winter heating must be far greater than for summer cooling. The conclusion may be drawn, therefore, that capital cost of the equipment and the operating cost for this type of system will not compare favorably with a conventional heating system at outside temperatures below 30°.

There is also a very serious operating problem in attempting to use the heat pump in localities with winter temperatures below 35°. Since it is necessary to operate the evaporator at least five to ten degrees below the outside air, it means that whenever the dew point of the outside air is above the operating temperature of the evaporator, moisture will condense on the evaporator, and at evaporator temperatures below 32°, the moisture will freeze and rapidly close the air passages through the evaporator, thus further reducing the heat output.

In the Emeryville installation, a coil was located in the outside air intake to provide preheating. A thermostatically controlled valve operates when the outside air temperature drops below 35° admitting city water to the coil. The minimum water temperature is 60°, thus the air is preheated and enters the evaporator at a temperature sufficient to permit operation above the freezing point to prevent frosting or freezing of the evaporator surface.

Other methods of preheating have been proposed, such as spraying water over the evaporator surface. Well water or city water of favorable temperature can be used as an auxiliary heat source. Electric space heaters have been proposed as auxiliary heat for low outside temperatures but the main objection is the short time peak load that would be imposed on the electric service. Many other schemes to take care of the winter peak loads have been proposed such as storage of hot water. These schemes, however, add to the capital cost and also add complications in operation.

As a result of research and of past experience with present installations, commercial application of the reverse cycle systems using outside air as a heat source, is obviously limited, at least for the present, to the temperate

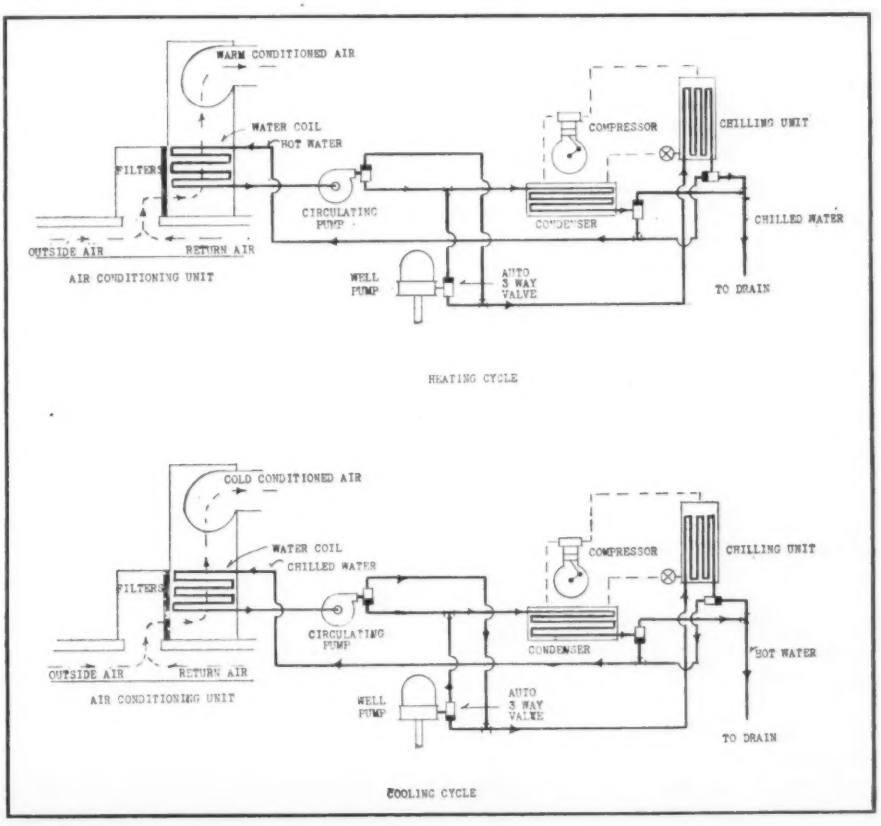
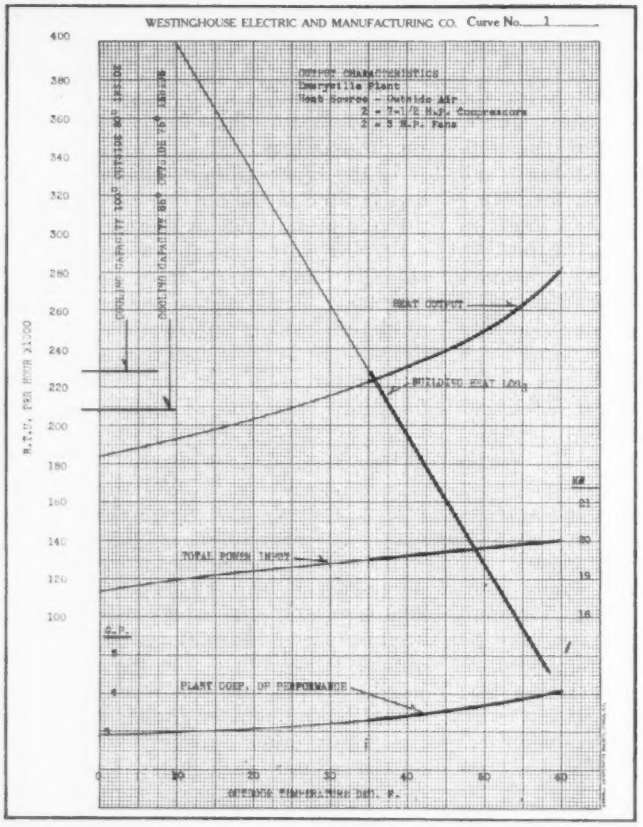
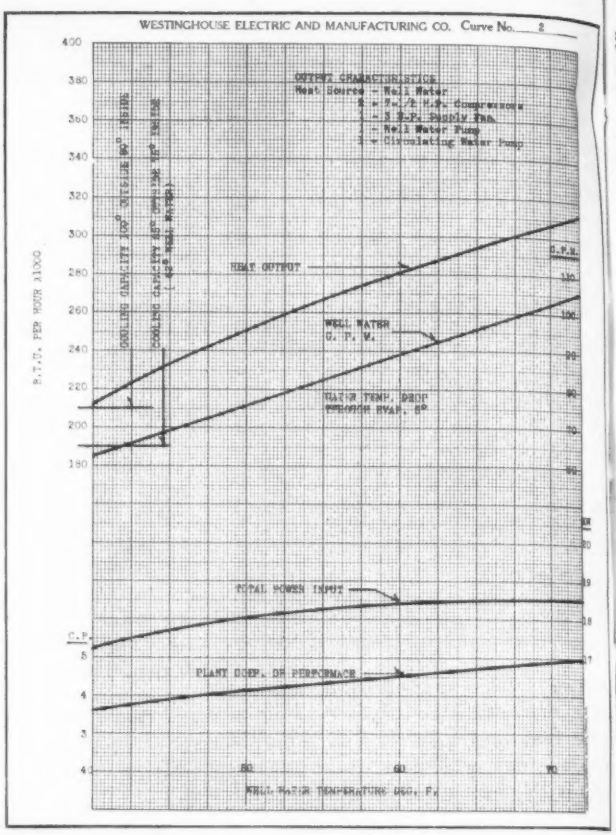


Fig. 3—Schematic diagram, water type reversed cycle air conditioning system


WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Curve No. 1
OUTPUT CHARACTERISTICS
Emeryville Plant
Heat Source — Outside Air
2 — 7-1/2 H.P. Compressors
2 — 5 H.P. Fans
HEAT OUTPUT
TOTAL POWER INPUT
PLANT COEF. OF PERFORMANCE
B.T.U. PER HOUR X1000
OUTSIDE TEMPERATURE DEG. F.

Curve 1—Emeryville plant output with air as heat source


WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Curve No. 2
OUTPUT CHARACTERISTICS
Heat Source — Well Water
2 — 7-1/2 H.P. Compressors
1 — 5 H.P. Supply Fan
1 — Well Water Pump
1 — Circulating Water Pump
HEAT OUTPUT
WELL WATER G. P. M.
TOTAL POWER INPUT
PLANT COEF. OF PERFORMANCE
B.T.U. PER HOUR X1000
WELL WATER TEMPERATURE DEG. F.

Curve 2—Emeryville plant output with water as heat source

climates such as California, Arizona and Florida.

Water Type Heat Pump

The schematic diagram in Fig. 3 illustrates a typical system using water as the source of heat. In order to compare this type of system with one using air, the equipment selected was based on the heating and cooling requirements of the Emeryville office building. The equipment would consist of one standard Westinghouse vertical type air conditioning unit; one standard water chilling unit; two standard 7½ hp. air conditioning compressors; well-water pump; circulating water pump, and four automatic three-way water valves. The refrigeration cycle would consist of two compressors connected to a common water-cooled condenser and a common water-chilling unit as shown in the diagram.

In the cooling cycle, the three-way automatic valves are positioned as shown. Well water is pumped through the condenser, then to the drain. Water is circulated through the cooling unit and water coil in the air conditioning unit by the circulating pump. The well water passes through the condenser, absorbs heat from the refrigerant, and the heated water passed to the drain. The chilled water passing through the water coil in the air conditioning unit, absorbs heat from the air passing over the coil surface and, in return, gives up this heat to the refrigerant in the chilling unit.

In the heating cycle, the three-way automatic water valves are positioned as shown. Well water is pumped through the chilling unit, then to the drain. Water is circulated through the condenser and water coil by the circulating pump. The refrigerant absorbs heat from the well water when it passes through the chilling unit. This heat, plus the heat of compression, is absorbed from the refrigerant by the water passing through the condenser. The heated water from the condenser is forced through the coil in the air conditioning unit by the circulating pump, transferring heat to the air passing over the coil.

Heat Output Characteristics

Curve 2 shows the heat output characteristics of the water type system briefly described. The heat output, quantity of water, total plant power input, and plant coefficient of performance were plotted for well water temperatures of 40° to 70° F. The total well water pumping head was assumed to be approximately 30 ft. Water quantity in gallons per minute was based on a temperature drop of 5° through the chilling unit.

It will be noted that with the same air conditioning unit, water coil, chilling unit, condenser and compressors, the heat output capacity of this plant varies considerably with the well water temperature available. For example, with a water temperature of 40°, and the well pump delivering 62.5 g.p.m., the heat output of the plant is 210,000 B.t.u. per hour; total power input is 17.2 kw., and coefficient of performance 3.6. With a well water temperature of 66°, and 89 g.p.m., the heat output is 280,000 B.t.u. per hour; total power input is 18.4 kw., and coefficient of performance 4.5.

The heat output of this type of system is not affected by outside temperatures as is the case with the air type system. The equipment selection for a water type system for summer cooling should be nearly adequate for winter heating, if the capital cost and operating cost of the plant is to compare favorably with a conventional all-year air conditioning system.

Selection of Type of System

The selection of the system, that is, whether it is to be designed for air as a source of heat, or water, depends primarily on the locality and the design of the building. A constant and reliable source of heat must be available, whether well water, city water or air is used. Well water temperatures are fairly constant the year around and surveys indicate that temperatures from

52° to 72° are available in the major portion of the United States. Well water generally can be obtained from 15 to 60 ft. below the surface of the ground. When available, well water is the most reliable and most convenient source of heat. Consideration must be given, however, to the chemical composition of the water and to its disposal. When expensive chemical treatments or the use of special metals are required, this would no doubt rule the well water out. Another important point is that extensive use of well water in a locality may lower the water table, increase the pumping head and thus limit the use of water systems.

The disposal of well water or city water also must be taken into consideration. If the waste water is discharged to the sewer, the sewer system may soon be overloaded and, when disposal wells are used, care must be taken that the water is disposed of in such a manner as not to short circuit to the intake well, thus affecting the well water temperature. Many cities have placed restrictions on discharging large quantities of water through sewers and also through disposal wells. If city water of favorable temperature is available, the source of supply may be limited, which would, of course, limit the use for air conditioning purposes.

Air type systems may appear to have the best possibility for wide use. However, we find that the heat output of an air type system diminishes as the outside temperature drops, limiting this type of system to localities with temperate climates. Experience indicates that the air type of system can be used successfully only in localities where the outdoor temperatures are 35° and above.

Self-Contained Units

A few self-contained, factory-built reverse cycle air conditioning units have been manufactured in the past. A typical self-contained unit is the Westinghouse type WB-06-R, a ½ hp. unit using outside air as a source of heat in the heating cycle. This unit is of the window type provided with an air-cooled condenser and, by means of a hand operated valve, the refrigerant flow can be changed so that the unit can be used either for cooling or for heating. This type of unit is suitable for conditioning small rooms. For heating purposes it is limited to localities where the minimum winter outside temperatures are 35° and above. A few installations have been made in Los Angeles. One such conditions a hospital unit of a large aircraft plant; another installation is for executive offices in Los Angeles steel plant. Results have been quite satisfactory.

Large self-contained units designed for using both air and water as the heat source have been proposed. However, it is doubtful whether any manufacturer will risk production on this type of equipment for some time to come. There are too many variables in design and the market is too limited to attempt factory production.

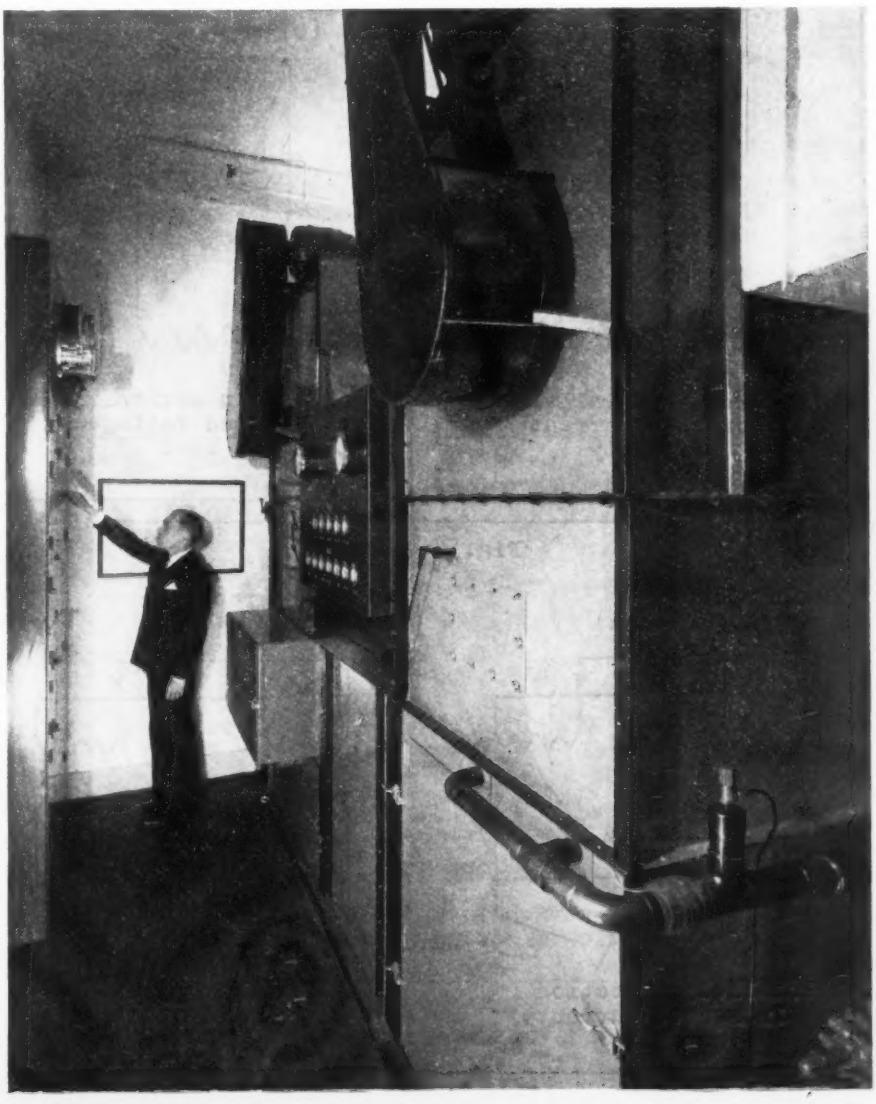
Conclusions

Reversed cycle air conditioning systems are economical and practical as year-around air conditioning, when designed and applied in accordance with good engineering practice. Experience with many installations in office buildings and a few residences shows that satisfactory operating results can be obtained.

This type of air conditioning has definite limitations of application. Success of an application depends on thermal and economic considerations rather than on mechanical design. Localities where differences between summer and winter weather conditions are not extreme are the best markets for reversed cycle. Where cold winters are common and of long duration, the refrigeration plant must be considerably larger than would be required for summer cooling. The capital cost of equipment for these localities exceeds that for conventional fuel burning air conditioning systems and the advantages of a reverse cycle operation disappear.

Where winter heating only is required and summer cooling non-essential, reversed cycle systems will have limited application.

To date the market for reversed cycle air conditioning is small but promising.



Air conditioning equipment at Emeryville plant showing condenser section in foreground and evaporator section in background. Motors shown above units are 3-hp. motors driving fans for exhaust air and for conditioned air. The photograph also shows gauge panel, thermostat controlling operation of the plant and the main control panel. The plant uses outside air normally but is supplemented by well water when the outside air temperature falls below 35°

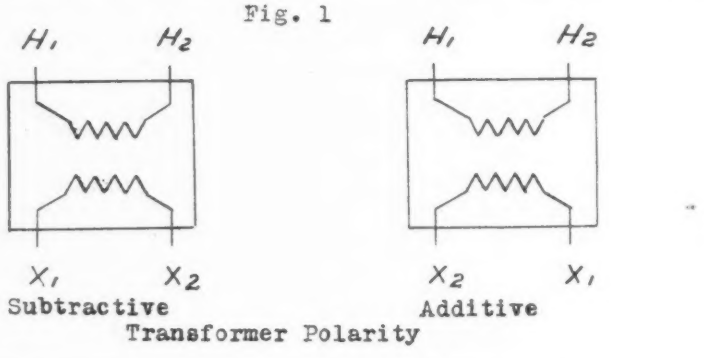
Transformer Connections—I Polarity

First in a series of four articles dealing with transformer connections and the resulting voltage and current relations

F. V. Gillum

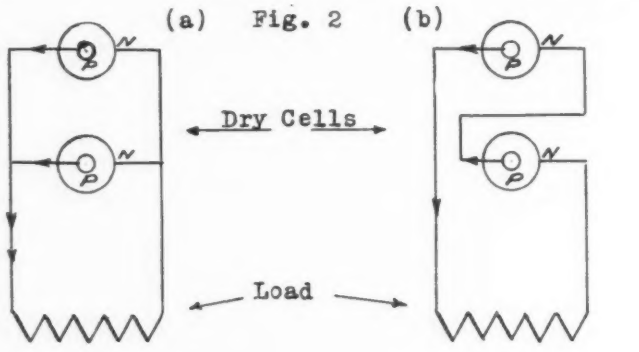
Southern California Edison Co., Pomona

Fig. 1



Transformer Polarity

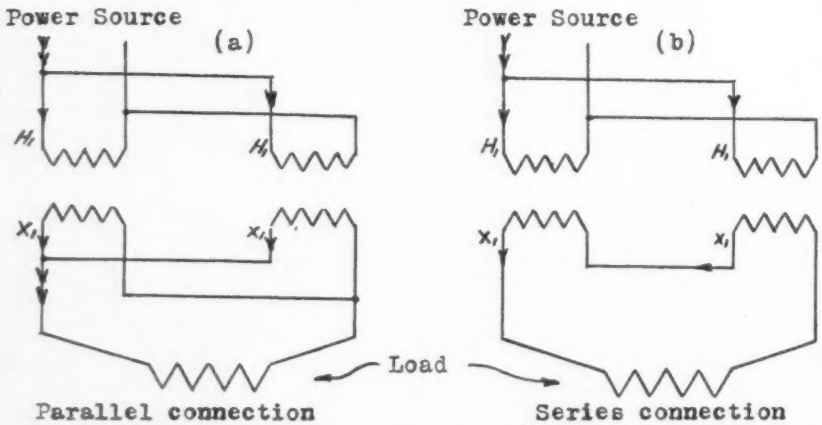
(a) Fig. 2 (b)



Cells in parallel
Increased current capacity

Cells in series
Increased voltage to load

Fig. 3



Parallel connection
Increased current capacity

Series connection
Increased voltage to load

TO the student and the instructor the subject of transformer connections calls for theoretical study of induced voltages and vector analysis. This is right and proper but the practical man in the field usually is not well versed in theory, nor has he much time to devote to academic study. He simply wants to be able to connect standard transformers, properly to supply power to a farm, factory, shop, or even an entire community. Then when the load increases, he wants to be able to connect properly another bank in parallel with the first one. He sees *additive polarity* marked on the name plate of one; another is marked *subtractive*, and perhaps the third has no polarity markings. To explain some fundamental principles, and thus enable the man in the field to have more confidence when connecting transformers, is the purpose of this series.

It is now standard practice to designate the high-voltage terminals of single-phase transformers by the marks (H1) and (H2). The low-voltage terminals are marked (X1) and (X2). By accepted standards the (H1) terminal is the left hand one, when facing the transformer from the low-voltage side. If the polarity is subtractive, the (X1) terminal is straight across from (H1). If additive, (X1) is diagonally across the transformer from (H1). See Fig. 1.

The marking of the terminals, or the known polarity, does not indicate the relative direction of winding of the high- and low-voltage windings. (See the author's article in the July 1944 issue of ELECTRICAL WEST, which briefly illustrates the effect of winding direction upon polarity). The (H1) and (X1) mark the high- and low-voltage terminals which have the same polarity. The fundamental rule to remember regarding the polarity marked terminals, is *in on polarity, out on polarity*. This refers to the relative direction of current flow at any given instant in the cycle of alternating current. See Fig. 3 and 4.

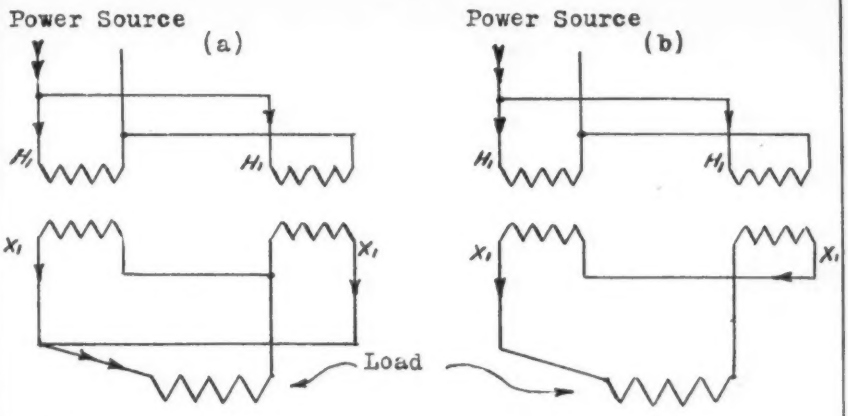
Single-phase transformers may be paralleled, or connected in series, in a manner similar to the connection of batteries. See Fig. 2. Also compare

carefully with Fig. 3 and 4. A battery has a positive and a negative terminal. The current flow is said to be *out* from the positive terminal. If additional current capacity is needed, another battery is connected in parallel with the first, by connecting together terminals of like polarity. If increased voltage were desired, the *positive*, or *polarity*, terminal of one battery would be connected to the *negative*, or *non-polarity*, terminal of the other. See Fig. 2a and 2b. In a transformer, at the instant current is flowing *in* at (H1), current is also flowing *out* at (X1). Thus the (X1) terminal may be thought of as the *positive*, or *polarity*, terminal and parallel or series connections are made as with batteries. Fig. 3a and 3b show these connections for transformers of the same polarity. Fig. 4a and 4b illustrate the parallel and series connection of transformers of unlike polarity. It should be noted that in a parallel connection, the voltage of the individual transformers must be the same.

In some cases there may be no indication of a transformer's polarity, or one may wish to check existing markings. There are two simple methods for testing the polarity of a transformer. Both methods neatly prove the rule—*in on polarity, out on polarity*. One method employs any alternating current lighting circuit, and an a-c voltmeter. Connections are made as in Fig. 5. The voltmeter is first connected to measure the voltage "V" impressed on the high-voltage winding. It is then connected, as shown, to measure the voltage "V" plus or minus the induced voltage "e" of the low-voltage winding. Fig. 5a illustrates the test of a subtractive transformer. The arrows shown represent the relative direction of the induced voltages, which are in such relative direction as to tend to cause a current to flow *out* from both (H1) and (XI) at the instant exciting current is flowing *in* to (H1). These voltages oppose each other through the voltmeter in a *subtractive* transformer, but assist each other in an *additive* transformer, as in Fig. 5b.

The second method employs a low-voltage battery connected to the high-voltage winding through a switch, and d-c voltmeter. The a-c method is recommended for use when possible, especially for larger power transformers. Fig. 6 illustrates the essentials of the d-c test. As the switch is closed, current flows *in* on *polarity* (H1), and during the build up, voltage is induced in the low-voltage winding which is in such a direction as to tend to make current flow *out at polarity* (X1). Care should be taken to disconnect the voltmeter before opening the switch to protect the meter from possible damage due to the inductive "kick."

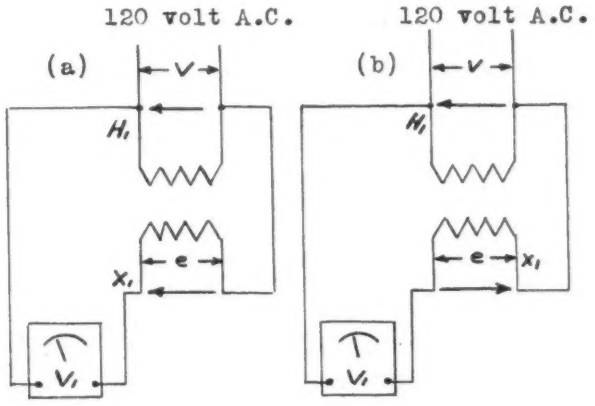
Fig. 4



Parallel connection Increased current capacity

Series connection Increased voltage to load

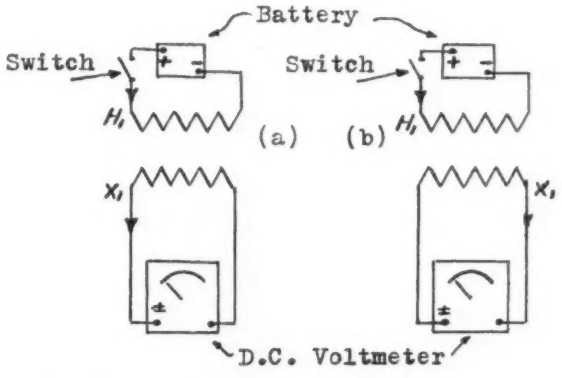
Fig. 5



$V_1 = V - e$ $V_1 = V + e$

Subtractive Polarity Additive Polarity

Fig. 6



Forward deflection Backward deflection
As battery switch is closed

[Second in the series of articles will cover the use of vectors]

Problems in Electric House Heating

Northwest house heating program would build 100,000 kw. load in five years. Question confronting engineers is, shall application be by space heating, panel heating, heat storage or by the heat pump?

METHODS of converting electrical energy into heat and means of applying it to house heating present many serious questions to those interested in the promotion of electric house heating in the Pacific Northwest. In a previous article (*Realism in Electric House Heating*, ELECTRICAL WEST, March 1945, p. 61), practical aspects of the rate situation were presented. Assuming that compensatory rates are established which will attract some volume of this business, the question then becomes one of how best to apply electric heating to residences.

There are at least four general approaches to the problem, each with some ramifications. These are: Space heating with individual unit heaters; panel heating; heat or thermal storage systems, and the heat pump. Load characteristics and the status of development of each will be discussed briefly to give many a better over-all picture of the house heating problem. It is assumed for purpose of this discussion that houses to be electrically heated will be properly insulated. Heat insulation of houses is a large subject in itself, and may be dealt with in a separate article at a later date.

Space Heating

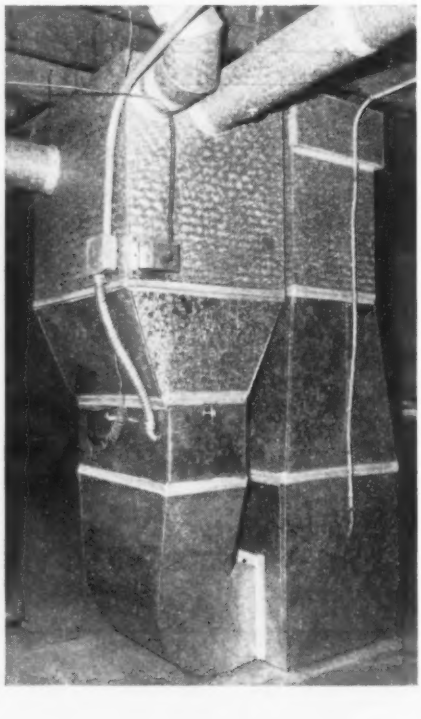
Of the four general methods of applying electric heat to homes, data are available on only one system that is based upon a sufficient number of installations to supply dependable information. This is with the method that employs space heaters. Some reliable information, although far from complete, is now available in the Northwest on some hundred odd houses in Longview, Wash., about 30 homes in Portland and on 100 electrically heated apartment courts in Portland. Bonneville is gathering data on those in Longview and Portland General Electric Co. on those in Portland. Information is complete on kilowatt-hours and bills, but engineers are not satisfied with completeness of data on demand, diversity and load factor.

Since practically all electric heating of residences in the past has been done by space heaters and in view of the fact that equipment for this method of heating has been quite fully developed, it is probable that early promotion of electric house heating in the Northwest will be along these lines. Individual room heaters, each thermostatically controlled, are favored by many. There is only one way of preventing space heaters from becoming an undesirable load for the serving utility. That is by requiring each heater to be thermostatically controlled so that the house heating load will be a 24-hour load with very high daily load factor. It is advantageous with any heating system to operate it on a 24-hour basis, maintaining 70° in the daytime and about 60° at night.

A demand type of rate undoubtedly will be used to induce the customer to break up the heating load into as many small units as possible and to operate them throughout the 24 hours of the day. As a further measure to help hold down demand, some companies may require the kitchen heater to be double-throw switched against a bedroom heater, so that only one at a time may be operated.

Data so far available would indicate that the connected load per house for the territory west of the Cascade Mountains would range from 12 to 20 kw., and average a little over 15 kw. Based upon preliminary information from Longview, it appears that a diversified demand of about 6 kw. per house can be obtained in that particular area. Annual load factors up to 25% are said to be possible. Based upon costs in Portland and Longview, it is expected that a space heating installation will average about $400. This compares with $500 to $600 for modern automatic fuel burning systems.

Recent installation of a central electric furnace made by the Ace Electric Co. of Portland, which looks promising. Eight 2-kw. Chromalox strip heaters are controlled in 2-kw. steps by a Minneapolis-Honeywell bridge circuit control



Electric Furnace

Central electric hot air furnaces might be placed in the same general category as space heating. One manufacturer in Portland is making this type of heating system and one of the accompanying photographs shows a typical installation. This system has many points in its favor and a number of utility men are enthusiastic over its possibilities. The installation shown contains eight 2-kw. strip heaters placed in the filtered forced air circulating system.

A unique feature of this furnace is that the strip heaters are controlled in 2-kw. steps by a control device operating on the bridge-circuit principle. If the house was cold and the furnace should be turned on, there is a five second time delay between the successive cutting in of the 2-kw. heating units. These features appeal to the distribution engineer. One of the doubtful advantages claimed is its adaptability to existing hot air systems making it easy to convert to electric heat. Very few old *hot* air systems can be converted economically to modern high air volume *warm* air systems. Heat losses are said to be small and only sufficient to take the chill off the basement and to provide a small amount of desirable heat beneath the floor.

Demand, diversity and load factor should be about the same as with unit space heaters thermostatically controlled. Cost of a complete house heating installation is said to compare fa-

vorably with modern automatic competitive fuel fired systems.

Panel Heating

Panel heating has attracted attention on the Pacific Coast in recent years and there are several commercial applications, notably with the heating wires installed in concrete floors. England has contributed considerable information, and the University of California has been conducting research for several years. As between ceiling, walls or floor, it would appear that application at the floor possesses some advantages. Perhaps manufacturers will develop a fireproof heating pad that may be installed beneath rugs.

Regardless of how applied, panel radiant heating will have somewhat the same load characteristics as the unit heater. It does have a possible advantage, however, in that comfort can be had with a much lower room temperature. Moreover, the temperature gradient between ceiling and floor is low. However, panel heating still requires much development work before it is a package job ready to be offered to the public.

Thermal Storage

Thermal storage systems seem to offer possibilities, and much experimentation and development work is now going on. Bonneville has one job under observation. A man by the name of Wortes, in Spokane, has another. The Washington Water Power Co. is gathering data on this installation, and an article will appear in ELECTRICAL WEST at a later date.

Any of the many thermal or heat storage systems that may be developed into low-cost package units, have inherent in them the possibility of off-peak operation if desired. The Spokane job requires only six hours input of the installed 20 kw. out of each 24 hours to maintain 70° with not more than 1° variation. Heat losses in these systems are an ever present design problem, and the probability of high first cost is an important factor.

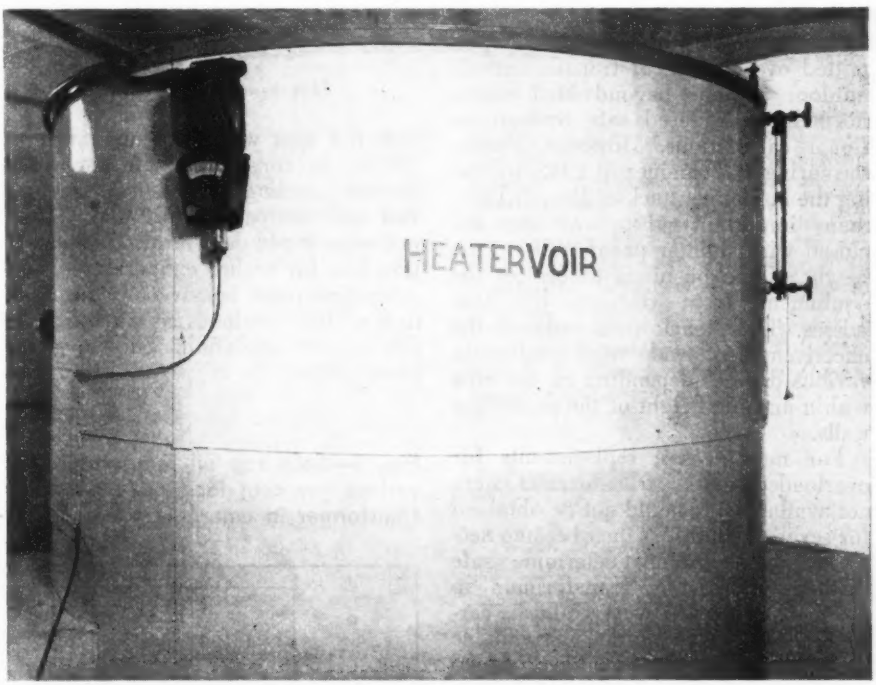
No one is prepared to say what the outcome will be with thermal storage systems, but the least that can be said is that they hold some promise. However, if their off-peak possibilities were not highly evaluated, characteristics of the load might not be any more desirable than with unit heaters or panel heating. Those who would look upon the thermal storage system as the *only* solution to the house heating problem should not overlook the fact that, with any appreciable saturation of house heating load, the heating load becomes the determining factor in the system peak and the shape of the load curve. Engineers point out that off-peak house heating in any degree of saturation (as low as 2% on one system) would determine the system peak and might only transfer troubles to some other time of the day and result in little, if any, advantage.

Heat Pump

The heat pump holds promise of being the answer to many, many problems. In its present stage of development, there is one unsolved problem that can be its death knell in cold climates, if not overcome. The heat pump, or reverse cycle refrigeration as it is sometimes called, in principle is nothing more nor less than a conveyor system driven by a motor that taps a free "coal" pile outside the house. Provided there is a suitable external source of heat, the amount of heat liberated inside the house may be approximately four times the heat equivalent of the energy required to drive the compressor. This means, obviously, that 8 mill current for the heat pump is the equivalent of 2 mill energy converted directly into heat by the resistance method.

The possibilities with any such proposition are intriguing, to say the least. Moreover, the refrigerating cycle may be reversed, or dampers manipulated to change the direction of air flow, and the system at once provides summer cooling. Where summer cooling can be used advantageously, as it very likely can east of the Cascade Mountains, the heat pump strikes at the very crux of the whole house heating problem—that of good annual load factor, and a quite attractive rate might be offered for this type of load.

Unfortunately, however, there is one stumbling block at the present time. That is, the lack of a system that will extract heat from the outside air when the temperature falls below about 30°. Since air is the most logical source of heat, some solution to this problem must be found if the heat pump is to be in the picture. Extracting heat from the outdoor air, even when the temperature outside is below freezing, is foreseen as being a definite commercial possibility in the near future by some engineers.



Another approach to the electric house heating problem is the heat or thermal storage system. Here is shown a 550-gal. hot water storage tank using four 5-kw. insert heaters. The Washington Water Power Co. is cooperating with inventor in compiling operating data

Water, of course, would offer a solution, but it is considered impractical to dig one or more wells in every back yard. Nor is city water thought to be the answer because of the high cost, even if its use were permitted on any large scale.

So intense is the interest in the heat pump, that ELECTRICAL WEST is publishing an article on page 65 of this issue dealing with its present state of development and some of the problems involved in its application in cold climates. So intense, likewise, is the interest in electric house heating in the Pacific Northwest that ELECTRICAL WEST will continue to publish information on the many ramified problems involved.

Transformer Emergency Overloading

Winding hot spot temperature is determined from top oil temperature in emergency overloading of power transformers. Example and curves illustrate method employed

R. J. Cobban and L. W. Lengnick
Hawaiian Electric Co., Honolulu

WITH the outbreak of war, the load on many transformer substations in and around Honolulu was increased with the stepped up war activities. Fortunately, the increased cooling by trade winds prevailing in the area and maximum ambient temperature of 31°C. permitted overloading of transformers in outdoor stations beyond load values normally considered safe by conventional calculations. However, during the spring and summer of 1942, following the bombing attack of Dec. 7, 1941, many important substations were enclosed with splinter proof walls to the height of the bushings to protect the equipment from damage by near misses. These enclosures reduced the effectiveness of trade wind cooling in various degrees depending on the area within and the height of the protecting walls.

For many cases, replacements for overloaded power transformers were not available and could not be obtained for several months. It then became necessary to accurately determine safe loading of existing transformers in order that vital war work could be carried on up to the limit of available transformer capacity. To have burned out the transformers by excessive overloading would have resulted in a serious interruption of war effort.

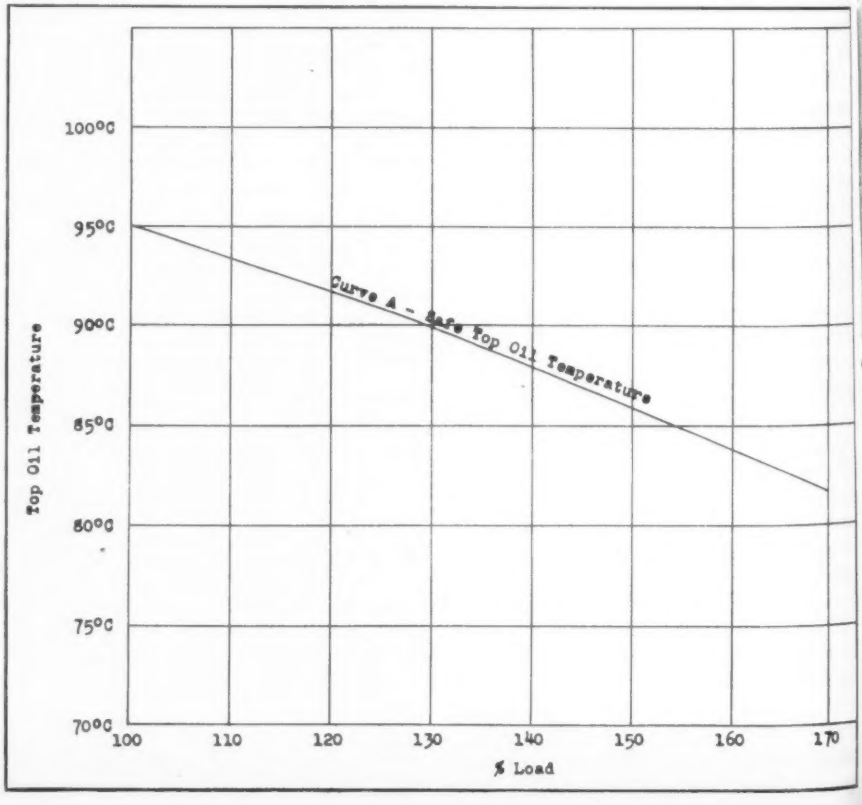
For these reasons a careful study was made of recent technical papers on the subject of emergency overloading of transformers. These papers give valuable information for the calculation of temperature gradients between copper hot spot and top oil temperature, but do not take into account the increase in cooling effect of natural air currents in outdoor substations. It has been determined by observation that the top oil temperature of transformers in outdoor substations carrying full load with moderate trade winds blowing is much lower than shown by factory test reports where tested in still air. All of the technical papers reviewed exclude from their calculation of top oil temperature the increase in cooling from natural air currents. There is a need for additional data on transformer loading based on actual top oil temperature. The top oil temperature as read from thermometers which are tested for accuracy gives reliable data under all conditions of cooling and loading. It is necessary, however, to translate this measured top oil temperature into winding hot spot temperature as a safe guide for emergency overloading of transformers.

Hot Spot Temperature

A hot spot winding temperature of 105°C. is considered safe for transformer windings in oxygen free oil. Hot spot temperature of 105°C. will not cause rapid deterioration of insulation but, for higher temperatures, consideration must be given to the duration of the overloads as affecting the life of the insulation. This does not come within the scope of this discussion. For transformers with oil in contact with air, a hot spot winding temperature of 95°C. is considered safe, though some sludging may develop at this temperature. Having determined the permissible hot spot winding temperature for the transformer under study, it is possible by the use of known data on temperature gradients to construct a safe top oil temperature curve for all load conditions. Such a curve is in effect, the permissible hot spot temperature from which is subtracted the calculated gradients between the winding hot spot temperature and top oil temperature as measured by a thermometer.

A typical example is given to illustrate the construction and use of such a safe top oil temperature curve. One substation serving an important war effort contained a 208-kva., 10%, 12-kv., three-phase step type regulator, supplying two 1,000-kva. three-phase, O.I.S.C. transformers, 11-kv. delta primary, 13-kv. grounded star secondary.

Fig. 1—Safe top oil temperature for various per cent load on a particular transformer in emergency overloading



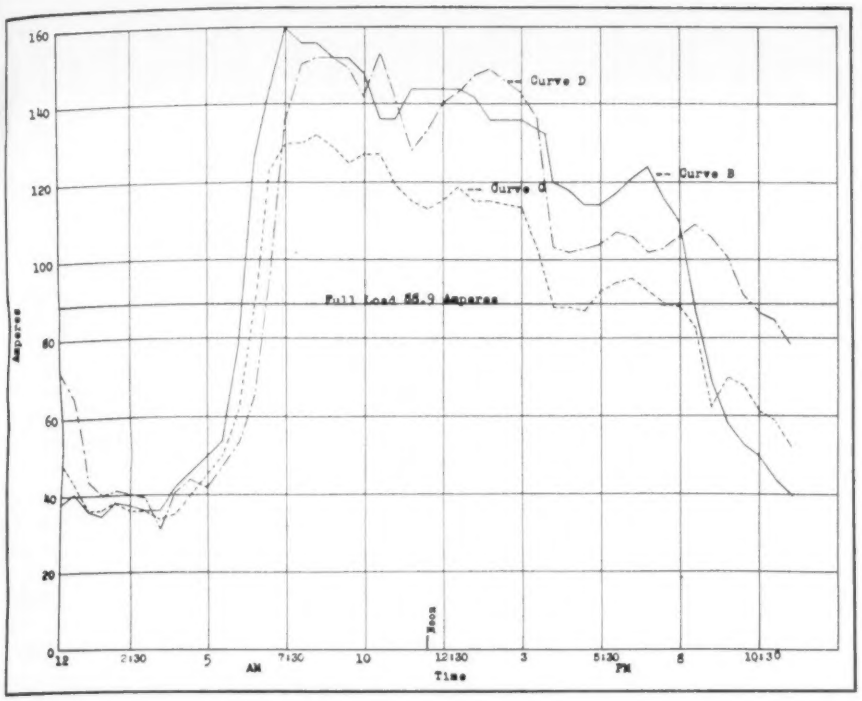


Fig. 2—Typical daily load curves for bank of 1,000-kva. three-phase transformers carrying emergency overloads

These transformers are of the sealed type and have strap wound primary and secondary coils with both sides exposed to oil. This transformer is assumed to have a temperature gradient of 10°C. from top oil to hot spot at rated load. At all overloads, it is assumed that this gradient will vary as the 0.8 power of copper losses which, in turn, vary as the square of load current. This gradient then may be calculated for all load values as $10°C. \frac{(\text{total amperes})}{(\text{name plate amperes})} 1.6$ from which the following results are obtained:

Load	Gradient	Load	Gradient
100%	10	140%	17.13
110%	11.66	150%	19.13
120%	13.38	160%	21.21
130%	15.22	170%	23.37

Curve "A", Fig. 1, is plotted, based on 105°C. hot spot from which above gradients are subtracted to obtain safe oil temperature curve. When the operator has a top oil thermometer reading below this curve for any overload, no action is necessary; but when the temperature for any load is found to be above the curve, he may report the readings for decision of others as to action required. A typical eight-hour day shift load for approximately four months prior to the erection of splinter proof walls as measured by a recording ammeter in the 13-kv. winding of the transformers, name plate rating 88.9 amp., is shown in curve "B", Fig. 2. During this period, the maximum top oil temperature on one transformer was 82°C., the other showed 83°C.

The regulator oil temperature during these overloads reached 65°C. This low temperature is explained by the fact that the regulator was operating at or near neutral at maximum load and only a small portion of the series windings was in the circuit.

Following the erection of splinter proof walls at this station, another feeder was made available. Part of this load was then transferred, after which a typical daily load curve as carried by this station for approximately eleven months is shown by curve "C", Fig. 2.

The consumer through error transferred to this station the load from another feeder during an outage. This excessive overload continued for part of one day shift and the early part of the following day shift. The recording ammeters had been removed and the method of metering this load was by a recording kva. and kw. meter with a full scale reading of 2,700. This meter was off scale, but from available data this overload was computed to be about 170% as shown by curve "D". The maximum temperature was 93°C. and 95°C. as indicated by the maximum temperature pointer of the top oil thermometer. Calculation of hot spot rise above top oil temperature during this period of excessive overload by the above method indicates a hot spot temperature of 119°C., which is within the limits as shown in Table I of the Interim Report of the Transformer Subcommittee, AIEE.

These transformers were replaced when new equipment was available. The core and coils were removed from the tank and found on inspection to be in excellent condition. The oil tested 30 kv. and its acidity was .056 milligram of KOH. One of these transformers is now back in service, the others ready for use when needed.

The condition of these transformers following 15 months operation at loads and temperatures not considered safe by conventional calculations seems to justify use of the method adopted. By permitting these overloads, aid has been rendered to the war effort without damage to equipment. Transformers are now being purchased with copper temperature relays which will permit increased loading under favorable cooling conditions. Such a relay would have sounded a warning during the excessive overloading and, if not corrected, would have tripped the feeder breaker.

References:

1. *Hot Spot Winding Temperatures in Self-Cooled Oil Insulated Transformers*, by F. J. Vogel and Paul Narbutovskih published in *Electrical Engineering*, March, 1942.

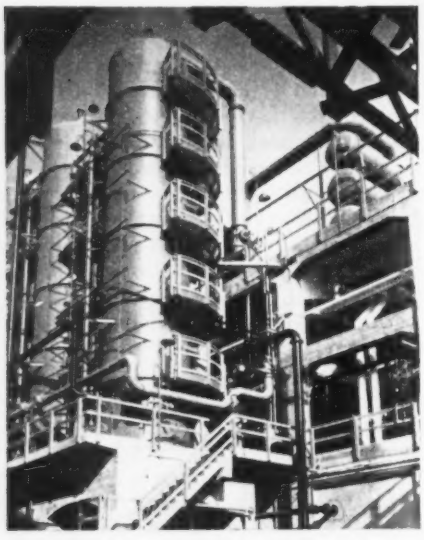
2. *Interim Report on Guides for Overloading Transformers and Voltage Regulators*, by AIEE Transformer Subcommittee published in *Electrical Engineering*, September, 1942.

3. *Emergency Overloading for Oil Insulated Transformers*, by F. J. Vogel and T. K. Sloat published in *Electrical Engineering*, September, 1942.

Interrupting Shorts

Ways of completely and swiftly interrupting short circuits of as much as 5,000,000 kva. in super power systems of the future, were discussed by A. W. Hill and W. M. Leeds, section engineers of Westinghouse Electric & Mfg. Co. before an eastern AIEE meeting. Circuit breakers already have successfully interrupted as much as 3,500,000 kva. and are in every day use. Laboratory work gives considerable assurance that, when needed, breakers having ratings of 5,000,000 kva. can be made available. Whether the advantages of solidly tied together super power systems are to be fully realized may depend in considerable measure on protective equipment which can interrupt faults, they said.

Explaining how circuit breakers interrupt short circuits automatically, they outlined design considerations necessary to create breakers that can adequately handle anticipated concentrations of power. Without a high-power laboratory for the complete testing of equipment, the development of modern circuit interrupting devices to their present high state of effectiveness would have been virtually impossible.



Synthetic Replace Rubber?

What influence will the new wire insulations have on postwar wiring and for what reasons?

Fred Benz

U. S. Rubber Co., San Francisco

FOR many years rubber has been the most generally used flexible dielectric for wires and cables and, consequently, our concepts of desirable characteristics for such material are all based on experience with rubber. As a result of the war, it has been necessary to use synthetic insulating materials which, in general, have lower insulating and physical characteristics than those of rubber. The acceptable use of these materials with their lower values may result in a new concept of the requirements necessary for insulating materials in the postwar period for some applications.

Prior to the war extensive research work had been done to find an insulating material which would be noncombustible, and one which would not deteriorate in the presence of air and light as well as oil.

The first materials to become available commercially were Neoprene and Thiokol. These were used as coverings over rubber insulation as a protection against air, light and oil—particularly the latter. Neither has very high insulating qualities and, consequently, they are restricted to use as jackets or coverings, or where the voltage requirements are very low.

Synthetic Resins

The term "synthetic rubber" has been used rather loosely during this war period as applying to both vulcanizable materials and thermoplastic materials. Thermoplastic materials do not vulcanize. Strictly speaking, the term "synthetic rubber" applies to vulcanizable materials only, of which there are five general types. These are Neoprene, Thiokol, Buna-N, Buna-S and Butyl.

The next development was the polymers of vinyl chloride and copolymers of vinyl chloride-acetate which, when properly plasticized and stabilized, produce useful insulations. Both are thermoplastics and vary essentially in the plasticizers used to bring out special characteristics in the insulations.

Polyvinyl chloride resins themselves possess only mediocre electrical properties, but through the use of plasticizers these qualities can be improved. Often in the attainment of improved quality other characteristics are partially sacrificed. Here is an example: When they are properly plasticized, their resistance to flame is very good but, in order to obtain flexibility at low temperatures, it is necessary to use other plasticizers which impair the fire-resistant qualities.

Insulating compounds have been produced from polyvinyl chloride that have excellent dielectric strength; however, insulation resistance is low, the power factor and dielectric constant high as compared to natural rubber compounds. They also have the inherent defects prevalent in plastics, namely, they deform at the higher operating temperatures, and become brittle at low operating temperatures. Also they are affected by vibration, particularly at low temperatures.

Prior to the war these materials had been used extensively, in the building wire field in particular in type SN wire and, in spite of their low electrical characteristics, have been acceptable for special applications. In order to use these materials decided decreases in specification requirements, for insulation resistance particularly, have been necessary. This tendency to accept lower insulation resistance values as compared with natural rubber no doubt will continue to prevail in the postwar period, and may change our concepts of acceptable insulations.

Ethyl cellulose, cellulose acetate, cellulose acetate-butyrate, styrene, nylon, polyethylene, cellulose nitrate and phenol-formaldehyde resins are other resinous products suitable for insulations or jackets on wires and cables.

Nylon is an amide formulation which eliminates the use of the plasticizing agents required in some other thermoplastics, and is made in many types. Originally developed for women's hosiery, its use was later extended to bristles for the brush industry. A special type was developed for the wire and cable industry for use in combination with other materials, principally as a jacket covering, to improve the physical properties. Nylon has a high resistance to heat and abrasion.

Of all the synthetic resins, polyethylene is the outstanding material in electrical characteristics. It has high dielectric strength as well as an extremely low power factor and dielectric constant. However, it is flammable, and also it is a thermoplastic. Polyethylene is suitable as an insulation, particularly for high frequency communication cables such as used in radar, television, etc. It may also find application as insulation for wires and cables for other uses in the postwar period.

Synthetic Rubbers

Neoprene and Thiokol, as mentioned previously, being poor electrically, have little application as insulations. The same applies to Buna-N, which is a butadiene acrylonitrile copolymer having oil-resisting properties similar to Neoprene. All three of these materials are used for jacket compounds; Neoprene especially under oil conditions, and also where sunlight is a factor, as Neoprene is very resistant to sunlight.

Butyl is a copolymer of either butadiene or isoprene and isobutylene, developed primarily for the automobile

What future for

Buna-S	Buna-N
Thiokol	Butyl
Neoprene	
Thermoplastics	
Nylon	Glass
Polyethylene	
Cellulose acetates	

inner tube industry. It has high heat resistance and high resistance to the transmission of air, which make it well suited for this purpose. It has excellent electrical characteristics, but is difficult to apply as insulation and to vulcanize, particularly on continuous vulcanization equipment. Further development of this material is necessary for its use in the cable industry.

Buna-S, or GR-S as it is designated by the government, is the "War Baby" of the rubber industry. This is the type on which the government has spent hundreds of millions of dollars to construct manufacturing plants in different parts of the country which are primarily required to produce rubber for the tire industry. The wire and cable industry never required more than one-twentieth of the requirements of the tire industry; therefore, in establishing specification requirements, first consideration was given tires, and since there always have been differences between tire and cable compounds, some difficulties have been experienced using Buna-S in the wire and cable industry. Buna-S is a combination of butadiene and styrene, usually three parts butadiene, one part styrene. Butadiene can be made from either alcohol or petroleum. Styrene is a coal tar product.

Insulating compounds made from Buna-S in general have lower physical properties, higher water absorption values and lower insulation resistance than corresponding compounds using natural rubber. For example: a typical compound with Buna-S has a tensile strength of 1,000 lb. per sq. in. compared with 2,000 lb. for natural rubber, a mechanical water absorption value of 30 mg. compared with 15 mg. for natural rubber, and an insulation resistance constant of 2,000 as compared with 21,000 for natural rubber.

Industry specifications, such as ASTM, when using Buna-S, have been revised to recognize these lower characteristics. Because of our experience with natural rubber, these lower values were originally accepted with considerable hesitancy, but experience to date has shown that installations where Buna-S compounds have been used are satisfactory. If these compounds continue to perform satisfactorily, there no doubt will be a general revision of our former ideas as to what constitutes acceptable insulating characteristics in the postwar period. However, it must be remembered that this experience is confined at present to approximately two years against a background of many years of experience with natural rubber. Likewise, jacket specification requirements have been lowered from 3,500 lb. tensile for natural rubber to 1,800 lb. for Buna-S, Buna-N and Neoprene. Jackets meeting these requirements have been in use for some time, but their service performance is not comparable to prewar high-grade rubber jackets.

Miscellaneous Coverings

Glass: During the course of the war a greater use of glass as an insulation, applied in fibre form, has been developed for special applications. Glass has several very desirable characteristics. It has fairly good electrical properties, will not burn, and is nonabsorptive, but lacks resistance to abrasion. Because of its relatively poor abrasion characteristics, its use is restricted to combinations with other materials. The moisture resistance of glass, particularly at high temperatures, can be greatly improved by an application of the recently developed silicone resins. It has been successfully used in the aircraft field in combination with other materials as a covering for power and lighting cables. It also has some uses where high heat conditions prevail.

Asbestos: Asbestos has been used for many years in the wire and cable industry and its use has been extended in this war period. Aircraft cables, as well as many types of cables for shipboard use in the Navy, utilize asbestos. As a result, new and better forms of asbestos fibres have been developed which will find many uses for wire covering in the postwar period wherever heat resisting and flame retarding materials are required.

Summary

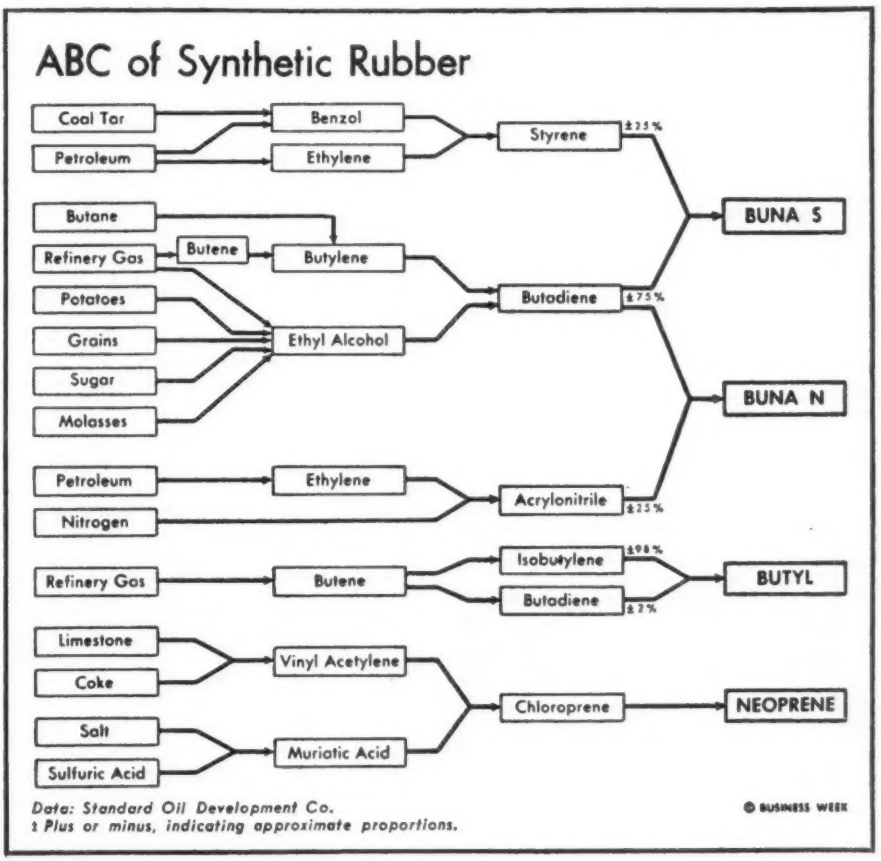
1. Natural rubber is still the best dielectric and will continue to be the best dielectric and will continue to be the most generally acceptable insulating medium, provided it is available.

2. Synthetic rubber insulating materials have been developed which, although not as good as natural rubber, have given acceptable service over a limited period. As a direct substitute for natural rubber, however, further development is necessary if we are to attain the high values maintained by natural rubber over a period of many years.

3. Thermoplastics will continue to be developed and will find their greatest use in special applications, such as in the high-frequency communication field, radar, etc.

4. With the ever increasing demand to eliminate fire hazards, the use of glass, asbestos and other heat resisting mediums will continue to be developed, particularly in the appliance cord field.

Materials that go into various synthetic rubbers shown in simple diagram form



Protection from Air-Borne Bacteria

New germicidal lamps, properly screened and installed, are used to protect persons and products from contaminations present in the air

WHAT about the germicidal lamp? This is a question everybody asks. Is it just dream stuff out of the postwar planners' imagination, or is it real? Does it kill bacteria and if so how? How effective is it? What are its limitations? Is it dangerous to humans and if so how? Can food be sterilized by it? Just what things is it good for and how is it used? How much of it is needed? What does it cost?

These questions buzz about even as the first models of germicidal lamps for homes, schools and offices begin to appear in dealers' stores. One also hears of installations in food processing plants, medical supply manufacturing plants, hospitals, schools, chicken houses, bakeries, breweries, etc. But such talk leaves much to be answered as to details and effectiveness.

Probably no one in the West has had so much experience and done so much pioneering in this new but promising field of electrical usage as the Tru-Air Ultraviolet Products Co. of Los Angeles. So ELECTRICAL WEST interviewed J. D. Gladstone, chief engineer of the company, to get the answer to these questions. From the information supplied by him and from examples in recent Western installations, probably the best picture of this new field of electrical opportunity can be gained.

The Light Source

The light source used is the standard General Electric germicidal lamp in both the 15- and 30-watt size. Lately, other manufacturers have announced similar lamps. Sylvania has made such an announcement and Westinghouse, likewise, may soon have one in addition to its older type Sterilamp, which is a high-voltage, cold cathode ultraviolet producer.

The General Electric germicidal lamp is a standard, tubular mercury arc lamp like the standard fluorescent lamp, but without the fluorescent powders and made of a special Corning glass which transmits ultraviolet radiations in the 2,537 au band. Ordinary glass filters out ultraviolet. These lamps list at $4.50 for the 15-watt and $6.75 for the 30-watt and are operated from standard ballasts used with similar wattage fluorescent lamps.

Handling the lamp safely is where the engineering of Gladstone came in. The first germicidal lamps produced by G-E were recommended to be used with a simple curved reflector, which directed the rays above eye level when the fixture was mounted on a side wall in a given room. This type of unit was used for certain hospital installations, in operating rooms, children's nurseries, where the object was the substantial reduction in the incidence of respiratory infections. Units are so designed now to avoid the direct or indirect irradiation of humans in a treated area, and to afford protection from ultraviolet burns (conjunctivitis —inflammation of the lining of the eye and erythema, skin burning). This new design evolved through the years provides a reflector which projects the rays towards the upper air of the room and away from the wall upon which the fixture is mounted. The baffle or louver attachments prevent the direct or indirect irradiation of human occupants of a treated area.

According to Gladstone, the field of germicidal applications is divided into two categories: First, is that of personal protection, in which the object is to aid in the prevention of human diseases which may be transmitted by air-borne bacteria. The second is product protection, the object of which is the suppression of mold and other bacterial contaminations in the food, biological, cosmetic and other similar industries, whose products are subject to air-carried bacterial contamination.

Personal Protection

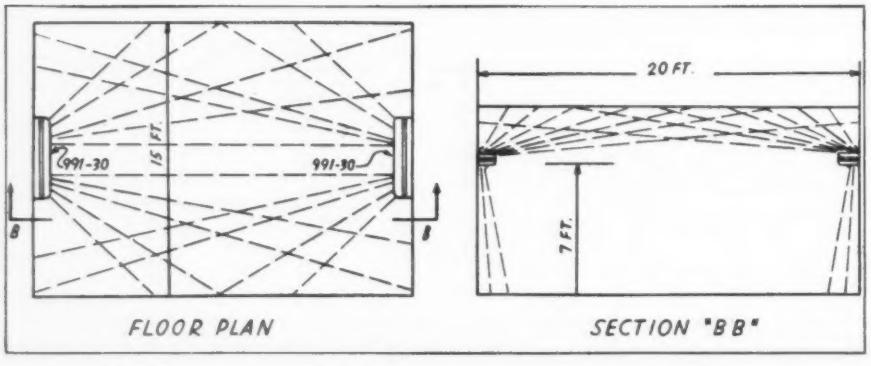
For personal protection, it was learned that bacteria responsible for many of the respiratory infections float through the air in the upper half of a room, much like tobacco smoke, and while bacteria similarly responsible for infections often adhere to dust particles and by gravity fall to the ground or furniture surfaces of a room, the primary concern is with the radiant disinfection of the air that is breathed. Consequently, if reasonable air disinfection is desired, a safe germicidal unit to use is one from which no occupant of a treated room could be within either direct or indirect radiation of an exposed germicidal lamp.

As to the effectiveness of this type of unit in protecting the people against infection in such areas, numerous tests have been made which show that a reduction of bacteria is effected sometimes in excess of 90%. The Petri dish method has been one of the means employed for making such tests. Gladstone, however, was emphatic that the germicidal unit was in no sense a cure.

"The unit is effective only within the limitations for which it was created. It is designed to produce and prevent the spread of infection due to air-borne bacteria. It is not in any sense therapeutic in its purpose or effect. It should not be confused with the sun lamp or any other therapeutic device. It is not a cure for those who have respiratory diseases such as cold, bronchitis, asthma, etc. It does not assure immunity against disease, nor can it be expected to be effective beyond the area in which the unit operates. However, it is a potent weapon against air-borne bacteria.

"These germicidal lamps will destroy a very large percentage of the air-carried infectious organisms in a treated room. The continued use of

Diagram indicating placing of germicidal units in a typical room installation



the equipment thereby lessens the probability of the transmission of communicable diseases from one person to another. This destruction of air-carried pathogenic organisms has the equivalent bactericidal effect of replacing polluted air in a given room with fresh, unpolluted air at the rate of 100 to 300 air changes per hour, dependent upon the number of units used in a given area. The room units are not designed to sterilize materials or room furnishings, however."

For room installations, where the object is "personal protection", this company recommends a mounting height 6½ to 7 ft. above floor level and upon side walls for its Rad-i-Air conditioners, the name given to this type of unit.

Personal protection afforded small children in the Westwood Country Day School, with units mounted on each of the side walls as shown in the illustration directly above

Another school installation at Ambassador Gardens nursery school and kindergarten, Los Angeles, where the units were mounted over windows and doors, a good place for them

Product Protection

One of the questions often asked is this: How effective is the use of the germicidal lamp in the processing of foods and protection of food products from bacterial contamination? No claims are made for 100% effectiveness in the killing of bacteria, nor in the sterilization of food or other products. However, protection has been successfully provided in the suppression of mold growths in the meat packing field, fruit packing, the baking industry and in the macaroni, spaghetti and cheese-aging fields. An article in ELECTRICAL WEST, Sept. 1944, p. 62, described the use of such equipment, designed by Gladstone, in the Cutter Laboratories at Berkeley, Calif., where the equipment was used for the disinfection of flasks and other equipment in the processing of Penicillin, replacing the need for using Bunsen burner flame during the inoculation process of this important wonder drug. The germicidal fixtures provide radiant disinfection and have resulted in 100% increase in the production rate of Penicillin. Similar applications have been used in laboratories which process important biologicals and blood plasma.

In the field of fruit packing, radiant disinfection protection has been provided against early spoilage by suppressing mold growths on raw, smooth-surfaced fruits, such as cherries, apples, pears, etc. One company processing citrus juices uses the germicidal equipment to prevent the recurrence of mold growths which previously had encrustated the walls in the producing premises and which often were found in substantial quantity on the extracting machinery employed in processing.

One of the most interesting of the fruit handling jobs was in the packing of asparagus. This installation was made in Yakima, Wash., in May of last year.

The only way that asparagus can reach the customer in a crisp condition is to submerge it into ice water before it is shipped. Usually asparagus is shipped in refrigerator cars to market. Such dipping is a common processing operation.

The asparagus is picked in the fields and loaded into lug boxes. Naturally, it carries with it the dirt of the field and considerable mold. Asparagus is washed on its way to the conveyor line, where it is sorted and packed.

The lug boxes then run along a conveyor to which is attached a saw which trims the edge of the asparagus evenly. The lug boxes then proceed to the ice dipping machine. This machine was 31 ft. long x 80 ft. wide, at the base of which was a container with water about two feet deep. Above the water are baffles upon which blocks of ice are placed. Conditions were such that the water was changed only about once every ten days. There were found to be present numerous colonies of *E. coli* and what appeared to be algae. The appearance of the water was quite "sandy".

The lugs of asparagus were placed upon a dipping baffle and then dipped into the ice water previous to shipment.

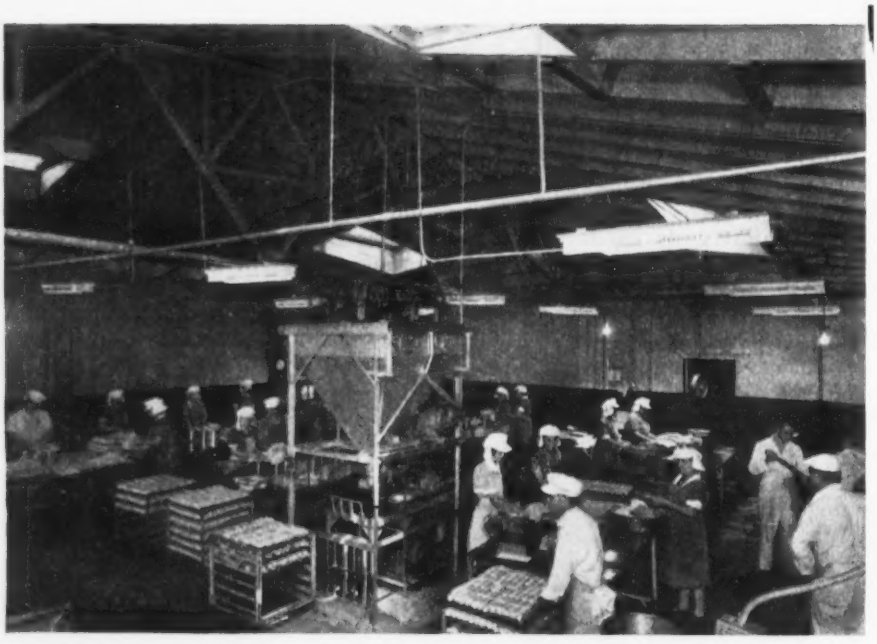
The Tru-Air engineer developed a means of containing 60 30-watt germicidal lamps on a steel plate 31 ft. long and 80 in. wide. The germicidal lamps were placed end to end and side by side, and the apparatus mounted with the light source two inches above the surface of the water. Means for aerating the water were provided also.

Within 35 minutes after the germicidal lamps had been turned on, the water appeared to be clear and tests showed a complete reduction of the coliform organisms previously present. The "sandy" sediment had apparently gravitated to the bottom of the water well.

The installation was checked by the Washington State Department of Agriculture field service and was found materially to have reduced the bacterial content, thus enabling the asparagus to reach the markets of the country in better condition, both crisp and fresh.

In this installation the germicidal lamp barrage was so arranged that the entire apparatus can be withdrawn at night when workers are not present in the area and operated generally to disinfect the air in the unoccupied shed.

In the smooth-surface fruit industries, financial losses are often caused by various molds. These molds adhere to the fruit during the field operations of picking and it remains on the fruit when it is brought to the packing houses in lugs for processing. Mold spores are usually abundantly present in the air of the packing sheds. Chemical procedures of disinfection during



Industrial type units installed in the tamale making factory of Superior Food Products Co., Los Angeles, which solves a serious problem of mold fermentation. Employees wear caps with visors as a further protection from direct irradiation

processing and sorting still leave the fruit subject to recontamination when it is placed in storage.

According to Gladstone, the general principles connected with the installation of germicidal equipment in the treatment of smooth-surface fruits are that the general air of all processing and packing and sorting areas must be irradiated. Germicidal fixtures should be mounted to the ceilings in such quantity as to provide maximum safe intensities of ultraviolet energy.

Further, in order not to subject workers to irradiation which may be harmful, additions to existing conveyor lines should be made and a barrage of encased germicidal lamps applied over such additional conveyor line to subject the fruits passing under them to a barrage of germicidal rays. Agitation of the fruit on the conveyor line is necessary so that all surfaces of the fruit may be irradiated.

Intensities of ultraviolet energy must be so governed and the speed of conveyor lines so arranged that blistering and oxidation of the fruit are avoided.

One installation at Myron Foster's Hesperian Orchards, Wenatchee, Wash., was reported by the owner:

"We were unable to get an actual check on the mold spore kill, yet we were satisfied that the cherries which were treated before being packed in our gift packages were better than the untreated cherries . . . As you no doubt know, our gift packages were shipped via express *without refrigeration*, so we consider the test rather severe. We are planning a more extensive treatment of our cherries with ultraviolet lamps next year."

Two installations pictured on these pages were those at the Superior Food Products Co., manufacturers of tamales, and the Coast Packing Co.'s sausage room, both in Los Angeles.

At the Superior Food Products plant, a severe mold problem was solved. Mold encrustations gathered on the ceilings and walls and required constant scraping and repainting. Further, a strong disagreeable odor pervaded the area. There were complaints, too, that the product was often sour to the taste upon leaving the ovens. Tests showed various aspergillus type molds present and a large mold spore count in the area.

In engineering this job, an approximate 70% spore reduction was promised. As a condition precedent to realizing this approximation, there were various procedures recommended. One was the thorough scraping and painting of the wall, ceilings and machinery in the plant and the use of a chemical detergent: all procedures required previous to the installation of the equipment. The reason for this was that the germicidal rays could not be expected to kill the existing mold encrustations on the walls and ceilings, but could only be expected to suppress and inhibit further growth of mold spores. Other recommendations as to sanitary procedures were offered and the client was most cooperative.

The installation consisted of one Rad-i-Air Model 981-30 for each 150 sq. ft. of space in the 1,800-sq. ft. room. The units were mounted 10 ft. from the floor and arranged with maximum precautions against the direct irradiation of employees. The employees were required to wear a protective sun visor as an additional precaution.

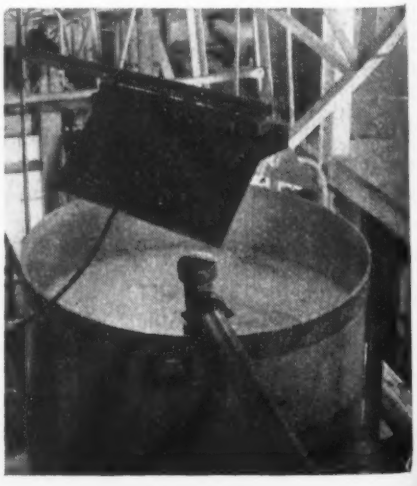
After several months of operation, there has been no noticeable return of the mold on either the walls or ceiling and there are no longer any objectionable odors in the area. The ozone generated by the germicidal lamps had neutralized the bad odor. The average amount of ozone generated by the germicidal lamps is one part of ozone to ten million parts of air in installations of this kind.

In the Coast Packing Co.'s sausage room, there was a similar mold problem, intensified by the high relative humidity of approximately 90°, which was necessary in the room. High humidities and the ingredients used in the room acted as an ideal incubator and nutrient for the molds. After 14 month's use of the equipment there has been no noticeable return of the mold.

The other installation pictured here was at a citrus fruit processing plant where mold was present on the walls and mold and slime were present on the machinery. The standard units were used for general air disinfection. Especially engineered models were used over the machinery and irradiation of the vats containing fruit juice were similarly undertaken. Excellent results in bacterial reduction were accomplished.

Germicidal units, manufactured by this company have also been found satisfactory for use in poultry areas. Chickens suffer from many of the same upper respiratory infections as do humans. Chicken pneumonia, influenza, bronchitis and coryza all take a large toll of chicken lives with resultant losses to breeders. Fungi attack the skins and plumage of chickens. The problem of irradiating chicken areas is intensified, from the standpoint of

Vat of orange juice kept free of mold formations by irradiation from a unit especially designed for direct rays



making adequate engineering recommendations, by the fact that some breeders maintain ideal aseptic conditions where others are not careful about sanitary conditions. The use of these germicidal lamp units in poultry areas has been found to reduce substantially the spread of epidemics of respiratory infections.

In one instance an epidemic of contagious chicken pneumonia was stopped in its tracks over night by a careful installation of such equipment.

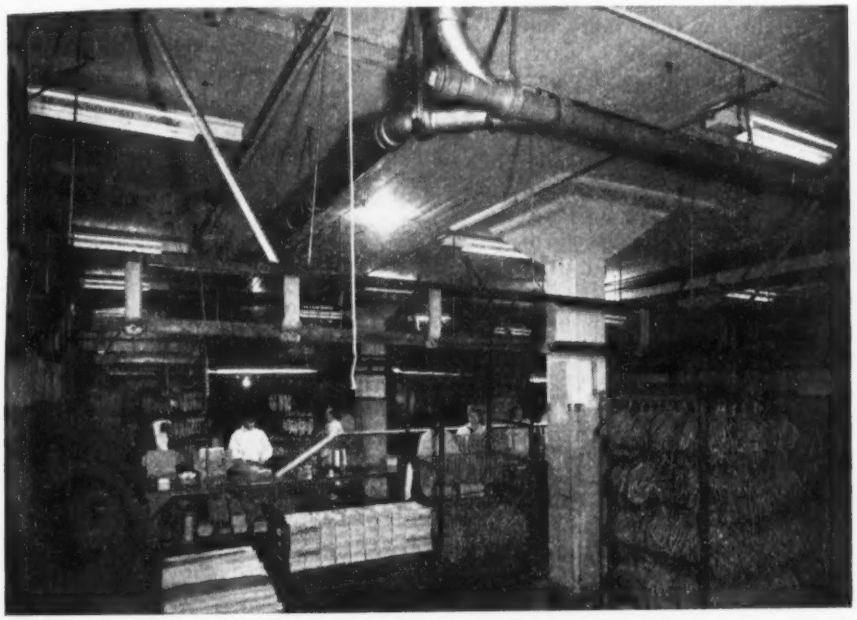
In general, the life expectancy of chicks is greatly increased. There is noticed a more luxuriant growth of feathers and stronger bone structure, partly attributed to the vitamin D content of the germicidal lamp.

Gladstone recommends the use of an unbaffled fixture utilizing a specular Alzac reflector. As a precautionary measure, from the standpoint of the possibility of burning the eyes of chicks, aside from the proper placement of the germicidal lamps, the use of several 100-watt incandescent lamps, mounted on the side walls three feet from the floor of any poultry area treated with unbaffled germicidal fixtures is recommended. The chicks are known to be more attracted to the brighter light source and, consequently, do not look continuously at the bare germicidal lamp. This method has prevented chicken conjunctivitis.

This manufacturer recommends that all existing measures of cleanliness, fumigation and the like be continued in poultry areas in addition to germicidal equipment. The use of germicidal equipment is not to replace any existing sanitary procedures, he stresses.

Other fields of application are rapidly being developed. Experiments are being conducted in the processing of dehydrated foods, in canneries, in citrus storage plants, in dairies and breweries. It is even hoped that equipment can be developed to achieve the equivalent of pasteurization of certain liquids among which are beer and milk. It is possible even now to disinfect water at the rate of 100 gallons per hour with an 8-watt germicidal tube, submerged.

While the installation for personal protection equipment can be estimated simply and made according to general directions, except perhaps in unusual cases, in the field of product protection areas are best treated after careful engineering study. Merely to place germicidal lamps around the premises may not solve specific problems.



High humidity made the atmosphere of a sausage packing plant conducive to the formation of mold encrustacions on the walls and ceilings, but irradiation of the air with germicidal rays has reduced this tendency and brought mold control

● THREE ADDITIONAL manufacturers have been authorized to produce a total of 14,350 domestic electric ranges during the first half of 1945, WPB announced recently. Authorizations for the first half now total 21,850 ranges, but production in the first quarter, ending in March, is expected to total almost 35,000 because of carry-overs.

● OFFICE OF WAR UTILITIES has amended supplementary order U-1-f to impose a 5,000 ft. limit on the length of extensions to preferred industrial and commercial consumers, limiting to 250 ft. the allowable length of extensions to seasonally occupied dwellings, and making certain other changes.

Planned Lighting

The welding of light and architecture into an efficient, functional unit, was the theme which the Lamp Department, General Electric Co., of the south Pacific division has presented, and which the Pacific division will present to architects and to the lighting industry in Los Angeles and San Francisco.

Initiating the program, the south Pacific division, under E. P. Markee, manager, held a meeting at Southern California Edison Co. auditorium, with the American Institute of Architects and the Producers Council, March 13, in Los Angeles, followed the next morning with a special meeting for fixture manufacturers and afternoon for fixture salesmen, illuminating engineers, wholesalers salesmen, utility lighting men and electrical contractors.

Program at the AIA meeting consisted of talks and demonstrations on: 1. New light sources for postwar architecture; 2. Lighting equipment and architecture; 3. Lighting design in relation to architecture; 4. The G-E architectural design program. At the close of the meeting, which was addressed by Henry Channon, Loux Hruby, Bob Clubly and directed by Markee, 54 full-scale renderings from the collection comprising a substantial part of the recent G-E architectural design commission project were shown.

The morning session, March 14, for fixture manufacturers, representatives of the ballast, accessory and lighting equipment parts manufacturers, had: 1. Status of new light sources; 2. Status of accessories, lamp holders, starters, ballasts; 3. New ideas in fixture design, with first West Coast showings of full-scale hand-made working models using new materials such as transparent metal; 4. A glimpse of the postwar lighting market.

For the afternoon session similar demonstrations were given, but the slant was on the sales rather than the manufacturing angle and the topics on the program were: 1. New lighting tools for lighting men; 2. New fixture designs, showing the full scale-models; 3. Illumination design helps to sell; 4. Sell lighting up; 5. A glimpse of the postwar lighting market for lighting salesmen, what it means to them.

Similar meetings are to be held for northern California under the direction of the Pacific Division, under Morris Hixson, manager, and addressed by Sam Hazelton, Jr., Reuben Lagerstrom and Walter Carlson. The meeting with architects and Producers Council is to be held in the Pacific Gas and Electric Co. auditorium, San Francisco, April 9, at 8 p.m., and the trade meetings at a later date. IES members also were invited to the architects' meeting.

EMEA *Dope Sheet*

Prevent Motor Burnouts

George Larsen
Chief Engineer R. A. Reed Electric Co.

MANY problems are encountered by maintenance engineers in keeping plant equipment in good operating condition. Among these problems is that of preventing electric motors from burning out. Some of the causes of electrical trouble in motors are beyond the control of the maintenance engineer but familiarity with most of the various causes will lead to the prevention of the same trouble occurring more than once. Many motor burnouts can be prevented by proper maintenance.

In order to present a clear picture of the actual causes of motor burnouts, a survey was made in a large motor repair shop of the causes of burnout, or reasons for rewinding, approximately 500 three-phase motors of various sizes during the month of December 1944. This survey revealed three major contributing causes of motor failure, namely:

1. Overheating
2. Foreign substances in the motor
3. Miscellaneous causes.

Listed below are the tabulated results broken down into the contributing factors for each of these causes, together with the percentage of each cause to the total of all causes.

1. Factors contributing to burnout due to overheating:
   - A. Single phasing 13.0%
   - B. Bearing failures causing destructive friction and overload 7.5%
   - C. Overloading due to actual load requirements.. 4.3%
   - D. High ambient temperature 3.2%
   - E. Defective rotor or rotor failure 1.9%
   - F. Wrong frequency 1.4%
   - G. Wrong voltage 2.4%
   - H. Overheating, cause indeterminable 4.0%

   Total percentage of causes due to overheating 37.7%
2. Factors contributing to burnout from foreign substances in motors:
   - A. Moisture 6.0%
   - B. Oil and grease..... 5.4%
   - C. Chemicals 1.9%
   - D. Metal chips and conductive and abrasive dusts.. 6.8%
   - E. Miscellaneous, such as broken fans, bolts, nuts, wrenches, etc. 4.6%

   Total percentage of causes due to foreign substances in motors 24.7%
2. Miscellaneous reasons for rewinding:
   - A. Change of voltage, phase, cycles, speed etc. 11.0%
   - B. Normal deterioration (old age) 3.8%
   - C. Coils cut out or winding unbalanced for some other reason 3.8%
   - D. Open circuits in motor coils 4.9%
   - E. Shorted coils, cause indeterminable 6.5%
   - F. Phase insulation failure 2.4%
   - G. Vibration of coils in slot 1.2%
   - H. Defective winding 1.3%
   - I. Unknown causes 2.7%

   Total percentage of miscellaneous causes 37.6%

The above tabulation reveals a number of outstanding causes of motor burnout which are usually to a large extent under the control of the maintenance engineer. Some of these are listed below.

First, 13% or 65 out of 500 motors burned out because of a single-phase condition. Some considerations which will aid in keeping single phase burnouts at a minimum are:

1. Careful installation of fuses to assure good contact at the fuse clips.
2. Periodic checking and adjusting of the contacts on magnetic starters.
3. Periodic checking and tightening of bolted connections in the control circuits.
4. Careful selection of the proper sized relay heating elements in the magnetic starter.

The second important item to note is that the burnouts due to moisture, oil, grease and chemicals were 13.3% or 66 out of 500 motors. The preventative measures which can help eliminate these burnouts are listed below:

1. Selection of proper type of motor enclosure to fit the severity of the installation when purchasing new motors.
2. Periodic "megging" of the winding insulation and baking and retreating the windings when the insulation shows low megohm readings.
3. Winding new motors or rewinding burned out motors with special treatment such as special moisture and chemical resistant insulations.
4. Protecting open motors with shields, especially outdoor installations during the rainy season.
5. Avoidance of over lubrication of bearings which cause lubricants to drop and collect on the motor windings.
6. Periodic inspection and removal of any surface oil or grease found on the windings. Grease and oil, if not left on the windings too long, may be removed by the use of suitable solvents.

The third major cause of burnout was found to be due to metal chips, current carrying dusts, metallic bolts, wrenches, and miscellaneous objects, shorting or grounding the motor windings. The sum of these causes totaled 11.4%. In other words 57 out of the 500 motors surveyed failed due to these causes.

The preventative measures to be employed in these cases are quite obvious, namely:

1. Selection of proper type of enclosure when purchasing new motors.
2. Building of shields or deflectors around open motors exposed to flying chips and other metallic dust.
3. Exercise of caution when working around motors to avoid dropping extraneous articles into the motor.
4. Avoidance of the use of high pressure air to blow out motors in attempt to clean them. High pressure air forces particles into the windings.

Fourth, 7½% or 37 out of 500 motors burned out due to bearing failures. These burnouts perhaps could have been prevented by employing some of the following practices:

1. Assuring proper amount, type and cleanness of the lubricant for the bearings of each motor. Many more ball bearing failures are caused by over greasing than from lack of grease.
2. Periodic inspection of motor bearings.
3. Checking for proper belt or chain tension.
4. Checking for misalignment of couplings or gears.
5. Avoidance of excessive thrust on motor bearings.
6. Selection of motors with enclosed

type bearings for all dirty locations.

Space does not permit discussion of each of the causes for motor failure, but it is suggested that consultation with the motor manufacturer or motor rewind shop will in many cases, reveal simple remedies for recurring motor failures.

If the rewinding shop is given complete information on any unusual operating condition of a burned out motor, changes such as the following can often be incorporated in the new winding which will provide added protection against future failures.

1. Use of special insulation treatment to protect against adverse conditions of excessively high ambient temperatures, moisture, chemicals, etc.

2. Slight changes in the motor winding specifications to protect against high-voltage operating conditions.

3. Changes in the motor winding specifications to assure best operation with the frequency on which the motor is to be used.

4. Redesign of the motor windings for increased torque and, or, cooler operating temperatures.

The conclusions drawn from the above survey of cause of burnout on 500 motors seem to be in accordance with the well known maxim "An ounce of prevention is worth a pound of cure."

Out of the causes of motor failure previously discussed nearly 50% or approximately 250 out of 500 motors burned out for reasons which are *commonly known, frequently recurring,* and *usually avoidable* with the practice of proper maintenance.

Apprentice Record

Motor shop devises needed form for manpower check

NOT as it used to be, the employing of people these days. Nor of advancing them according to what the proprietor thinks they are worth to his business. With manpower under government regulations and restrictions and wages frozen, a shop owner needs to have some accurate form of record for each and every employee.

California Electric Works, San Diego, ran into this quite decidedly recently in having its apprentice rates reviewed by the Wage Adjustment Board and War Labor Board. In an endeavor to find what others had in the way of record cards or forms to guide it, California Electric Works' shop manager, Frank Sloan, found nothing that applied to a motor shop such as theirs. Therefore he devised one.

It is reproduced here because it may be useful to other electric motor shop proprietors in setting up similar records for their own personnel.

Printed on letter-sized card, one is made out for each employee in the shop. Besides name, social security number, etc., space is provided for schooling and specific courses taken and trade experience. These are credited in years, months and weeks to his classification.

In the center of the card, space is provided for a full five-year record, no matter in which month or week the employee starts, with space to note the year above. Into this may be noted the steps of his pay increases, either as given him or as due. This forms a five-year record of pay and protects both employer and employee against any contention over dates or rates.

Below this are lines upon which the rating of the man as to industry, cooperation, speed, skill and potentiality may be noted. Under "Remarks" can be written any pertinent details, such as any promises made, dates set for advancement, notations affecting the rating of the man, such as sobriety, habits, honesty, etc.

Others using this form could adopt it and enter the schedules of pay prevailing in their own areas. In this company's program the apprentices are accelerated faster in the lower brackets, during the first year, and in longer steps in the later years.

With so many newcomers whose past experience is not known, it is also desirable to have some means of evaluating past experience and training and giving due credit for it in the scale of pay set for these people.

Form developed by San Diego motor repair shop to keep employee record

CALIFORNIA ELECTRIC WORKS 424 8TH AVENUE, SAN DIEGO

EMPLOYEE CLASSIFICATION AND PROGRESSION RECORD

NAME _____ DATE _____

SOCIAL SECURITY No _____ AGE _____ SEX _____ HIRED _____

RESIDENCE _____

	CLASSIFICATION CREDIT ALLOWABLE		
	YEARS	MONTHS	WEEKS
1. SCHOOLING ____ YRS. GRADE ____ YRS. HIGH SCHOOL ____ YRS. COLLEGE			
2. INDUSTRIAL COURSES TAKEN			
3. INDUSTRIAL AND TRADE EXPERIENCE			
4. CLASSIFIED AS CLASS ( ) ELECTRICAL REPAIRMAN ($) PER HOUR			

5.

	19__ WEEK	19__ WEEK	19__ WEEK	19__ WEEK	19__ WEEK	19__ WEEK
JAN.	1	1	1	1	1	1
FEB.	2	2	2	2	2	2
MAR.	3	3	3	3	3	3
APRIL	4	4	4	4	4	4
MAY	5	5	5	5	5	5
JUNE	6	6	6	6	6	6
JULY	7	7	7	7	7	7
AUG.	8	8	8	8	8	8
SEPT.	9	9	9	9	9	9
OCT.	10	10	10	10	10	10
NOV.	11	11	11	11	11	11
DEC.	12	12	12	12	12	12

IND.

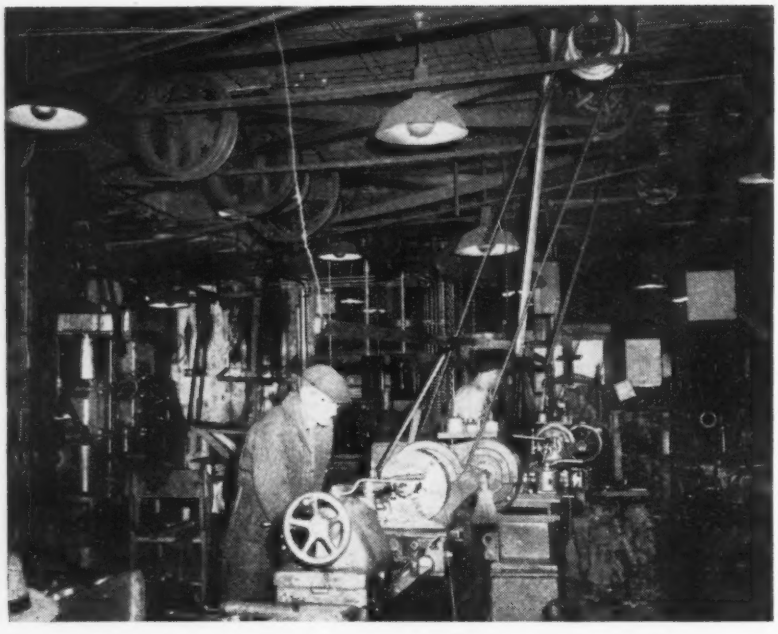
CO-OP.

SPEED

SKILL

POTEN ABILITY

6. REMARKS



LIGHT for a SHOP

Incandescent

Who

Drafting room of Westinghouse Electric & Mfg. Co. plant at Emeryville, Calif. Engineered by Westinghouse engineers, San Francisco.

The Need

Higher intensities of glareless, evenly diffused, uniform lighting, in a windowless area of large size, for concentrated eye work connected with detail drafting.

Conditions

Acoustical ceiling made indirect lighting undesirable.

Installed

Continuous strips of 2CL-40 Westinghouse fixtures in rows 3½ ft. apart, mounted directly on the acoustical ceiling, 11 ft. from the floor. The installation uses 300 40-watt fluorescent lamps, alternating daylight and white.

Results

Practically shadowless, glare-free illumination of approximately 60-ft.-candles at working levels maintained. Reduced heat load on air conditioning system.

LIGHT for DRAFTING

Fluorescent

Who

Multnomah Iron Works, Portland, Ore. Engineered by D. O. Bergey, utilization engineer, Northwestern Electric Co., Portland.

The Need

Small machine shop, the ceiling of which was filled with shafting and belts, required higher levels of illumination on the work at machine tools for more accurate measurements and finishing.

Conditions

Room with relatively low ceiling, cluttered with pulleys, belts and line shafting, leaving no room to install fluorescent fixtures.

Installed

Spaced irregularly on approximately 8-ft. centers, 9 ft. from the floor, there were installed RLM reflectors of the 750-1,000-watt size, lamped with 750-watt silver bowl lamps.

Results

An average of 65 ft.-candles of well diffused illumination on the working plane. Not ideal, but the one practical solution under the circumstances. Approaches indirect lighting in effect, without glare.

Contractor Outlook

The outlook for contractors, at press time, was contradictory. Further tightening of copper and steel controls, a decline in building permits for the seven Western states of 30%, mostly in Oregon and California, and other factors were on the negative side. The favorable progress of the war, however, gave reason for hope for early relaxations to permit some civilian construction again.

Stocks of materials are down in wholesalers warehouses, especially wire and conduit and small conduit fittings. Synthetic wire has almost totally replaced rubber covered and there is little of that. Wire shortages and restrictions probably come as a result of large stocks of combat wire destroyed or captured by the Germans in the Belgian break in December. What authorized building construction there is seems to be in war housing.

Labor availability is loosening up in Coast shipyard cities where shipbuilding contracts are running out and layoffs are running into considerable numbers. Conversion of some yards to repairs has not taken up the slack.

Among contractors who closed up their businesses to take on war work, many are returning and renewing their licenses and looking for work to perform. Prices bid on recent projects reflect the new and highly competitive condition.

Labor efficiency also has dropped so that bidders who receive contracts complain that labor costs are double or even three times what they should be.

Surplus materials disposal is beginning to take some tangible form but the usual crop of opportunists has sprung up to offer "tipster" information on where to get such surpluses. The war agencies having these materials are still the best source of information and a buyers guide is available from the Treasury Department, RFC, Maritime Commission, NHA or WFA, which will enable anyone interested in such surplus materials to get the "tips" they need. Defense Plant Corp. projects have lists of surpluses at each plant which may be obtained by interested contractors or utilities.

● Red Seal Wiring is still being done in Vancouver, B. C. The combined January and February report of the Electric Service League of B. C. lists 70 residences and duplexes in February, 129 for both months, in addition to which there were 123 which were wired to Red Seal standards except for the range. Materials are not as severely restricted in Canada as in the U.S.A. and a steady number of Red Seal jobs has been wired throughout the war.

● Because of Overcharges complained about by numerous customers of appliance repair shops, OPA has authorized its regional offices, if they choose to do so, to require from those doing appliance repair business that they furnish customers with detailed itemized statements of all work done, with the actual hours and hourly rates charged, and that they keep full records on the time spent by each employee doing repair work so that work not directly chargeable to repairs may not be put on a customer's bill.

Grease Rack Lift

As the barber raises his victim to cut his hair, materials and equipment to be loaded on a truck can be lifted to truck-body level by an hydraulic hoist, Electric Supplies Distributing Co., of San Diego, decided and put the idea into practice. Instead of building a raised loading platform and ramp or sacrificing much storage space by raising the entire warehouse floor level, Fred G. Goss watched a car being lifted to be greased and thought of an idea.

A new hydraulic hoist such as is used in gasoline service station grease racks was bought and installed in a 3-ft. deep pit to bring the rails below floor level. A heavy platform was built on the rails and boxed in at the sides so that when lifted nothing could get under the platform. The equipment cost about $1,000 complete.

Now a truck load of merchandise from various parts of the warehouse is loaded on the platform at floor level. By using the control button, the whole is raised to truck-bed level and is adjustable to trucks of varying heights. Even heavy items such as transformers can be handled easily by such a hoist.

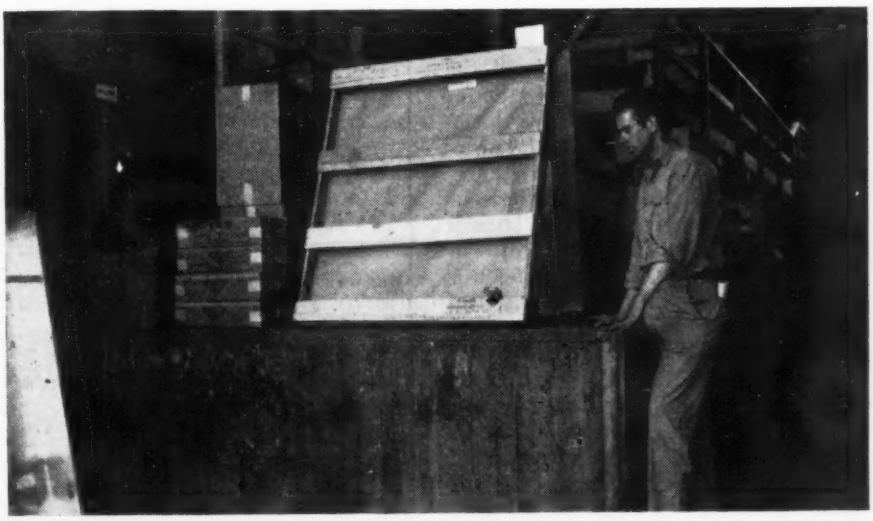
Surgery in Basement

Its surgery department in the basement in order to release all above-ground floors for patients' rooms, Berkeley Hospital will take full advantage of some of electricity's modern services in the design of its facilities. With scientific illumination, air conditioning, soundproofing, air sterilization and dust removal, the basement space, usually waste or storage space, will be utilized. The new hospital at Dwight Way and Milvia will cost about $500,000, and construction is to begin soon for completion before the year is out. The surgery department will have eight operating rooms, two for special surgery, one minor surgery and one for administering anaethetics. The maternity obstetrical rooms and the emergency operating rooms will also be in this section. Extensive sound and intercommunications systems are planned also by Lyle E. Patton, electrical engineer making the designs.

● Office of Price Administration has authorized distributors of Northern white cedar poles to use a 20% markup in sales to other distributors for resale. In raising the distributor-to-distributor markup from 15 to 20% and putting it on a level with distributor-to-consumer markups, OPA ordered that the markup be used only once, and that any increase in purchase price to a distributor must be absorbed by him.

● The California Licensed Contractor, publication of the California Contractors State License Board, has resumed publication after suspension for more than a year. It has been authorized for two issues in 1945; the first appeared in February, the next will come out in October.

Boxed-in grease rack hoist makes an adjustable supplies loading platform



Dealers Asked What THEY Think of It

Cooperative program of Utah Power & Light is explained and opinions asked by new booklet

ASKED what *they* think about the power company's sales program and their own suggestions and ideas earnestly solicited, electric dealers in the territory of Utah Power & Light Co. and Western Colorado Power Co. are having an opportunity seldom offered before, anywhere. In the past, some electric power companies have told dealers their plans, policies and programs and invited their participation. But this time the dealers are being asked to pass upon these things before the program goes into effect and to suggest improvements, express their preferences on some points, tell the company what they want in the way of sales help and promotion.

The medium for this solicitation of dealer opinion is a booklet now being distributed to all dealers, either by mail or by personal contact from field representatives. Two copies of it are given each dealer, one to keep, the other to return with his "vote" and comments. The booklet sets forth simply and directly what it has to say. It has on its cover, "A plan to help dealers sell electrical equipment when available. What do *you* think? Is there any way we can improve this plan? Read it—and let us have the benefit of your experience and judgment. Two heads are better than one!"

Inside, the first page tells of the preparation being made to increase sales activity immediately after appliances become available. The company plans to spend about $1,000 a day during the first postwar year. It wants to spend this money in a way to insure the best possible job in creating sales volume for dealers and the industry and it asks the reader's opinions and frank criticisms.

Next it tells the themes it will use —"Better living electrically," "Better business electrically," "Better farming electrically." Explaining these slogans, it then asks if they are effective appeals and asks for suggestions of any more effective appeals. Then it declares it will sell no merchandise itself and asks dealers if they prefer this policy or whether they feel the need of any direct sales of any special items by the company and if so why.

A sales force twice the size of the present one is promised and dealers are told what the duties of it will be in all fields. Then dealers are asked if they will take full advantage of their help and whether they desire assistance in training their own sales people. A definite promotion activity on all types of appliances is also promised and an idea of the opportunities for sales in the territory is given. Suggestions are asked for as to any ideas for promotional activities.

On a point that always has been difficult to handle, it asks the dealers for their preference. It asks how dealers wish to have the prospects which its efforts develop distributed, in rotation or to several dealers at once to let them compete for the business. Likewise, in offering display space in its company windows or on the sales floors of its offices, it asks dealers what they wish.

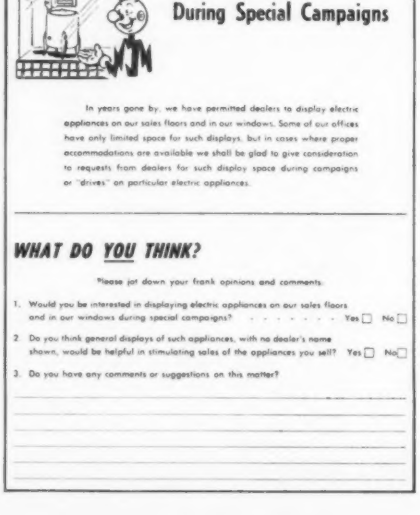
During the war, dealers have gone heavily into service business. The company declares that it wishes to encourage dealers to operate service departments and gradually get out of this work itself and again asks them to express their opinions frankly on this question.

Greatly increased home service activity is promised and again just what the dealers wish in the way of assistance from the power company home service personnel is asked. Farm, commercial and industrial promotions are likewise proposed and, after some details are explained, suggestions and ideas to help such market development for all concerned are requested.

Saying that it will use low-cost electricity as a sales appeal, it asks dealers if they will likewise use that theme. Then considerable explanation of the proposed advertising program of the company is given, its newspaper, radio, billboard, direct mail and store and window display media. Dealers are asked if they believe in this, and if they wish to be supplied with such material, too. Dealers are also offered the use of Reddy Kilowatt in their own advertising which ties in with the overall program to the public and urged to do as much advertising and promotion as they can.

No signatures are asked on the returned booklets, only a designation of the locality and the type of store answering. A postage free envelope was furnished with each to expedite its return.

One of the pages in the UP&L book



WE PLAN...

SPECIAL

Display Space for Dealers During Special Campaigns

In years gone by, we have permitted dealers to display electric appliances on our sales floors and in our windows. Some of our offices have only limited space for such displays, but in cases where proper accommodations are available we shall be glad to give consideration to requests from dealers for such display space during campaigns or "drives" on particular electric appliances.

WHAT DO YOU THINK?

Please jot down your frank opinions and comments.

1. Would you be interested in displaying electric appliances on our sales floors and in our windows during special campaigns? . . . . . Yes ☐ No ☐
2. Do you think general displays of such appliances, with no dealer's name shown, would be helpful in stimulating sales of the appliances you sell? Yes ☐ No ☐
3. Do you have any comments or suggestions on this matter?

What Crosley Thinks

That it is not going to be so easy sailing that no salesmanship will be necessary; rather that it will be a highly competitive market in which many strong manufacturers will vie for larger shares of the market, was the realistic viewpoint expressed by J. H. Rasmussen, general sales manager, the Crosley Corp., of Cincinnati, when he toured the West last month contacting distributors and dealers and setting up the pattern of postwar distribution. Every manufacturer, he declared, has done as Crosley has done, increased capacity to produce tremendously in order to make war products for the armed services. All will seek to employ as many of these facilities as possible in production. Such production will require tremendous sales effort to get maximum distribution.

In company with N. B. Dinkel, Western regional manager, Rasmussen visited Los Angeles, San Diego, San Francisco, Portland, Seattle, Spokane, in each city holding informal conferences with Crosley distributors and dealers. Predicted for postwar sales are a new line of kitchen cabinets which will embody some unique new features. With ranges and refrigerators, the cabinets will swing into a complete kitchen program; with automatic washer and dryer, into a complete laundry. A new technique in selling these cabinets is also promised.

Radio and television sets after the war, Rasmussen predicted, will reflect the improvements in design and skill in craftsmanship developed in producing electronic equipment to meet rigid and rugged military specifications and inspection. New models will be really new in radio, whereas, with appliances, the unused 1942 tools and dies will be employed for the first postwar models.

Dealers Refresh

Take course to brush up on lost art of selling

A REFRESHER course for dealers was a big success in Los Angeles. It was a success not only in attendance but in the attendance of the principals of the stores themselves, showing that they were eager to freshen up on the lost art of appliance selling.

The initiation of the course came from a survey of retailers made by the Department of Water & Power. A majority of dealers interviewed said that they would appreciate such a course, provided a speaker of sufficient background and authority could be obtained to present it. It was to deal with the principles relating to appliance merchandising.

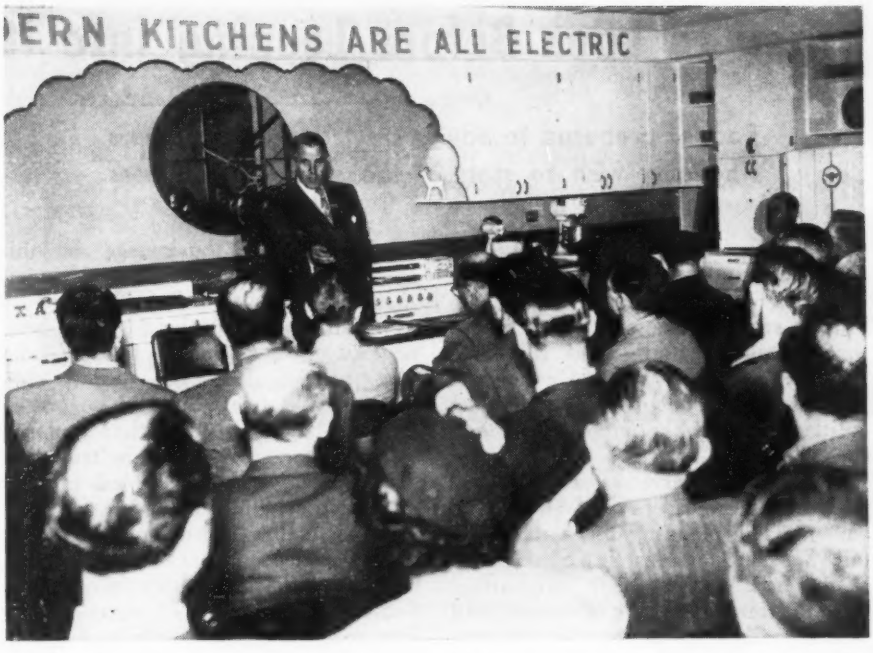
In cooperation with the distributive education service of the state and city schools, an outline was prepared. It covered (1) The potential local appliance market. (2) Capital; and store characteristics. (3) Sales organization. (4) Service organization. (5) Advertising and (6) Credit and financing.

Walter Elieson of the Department of Commerce was obtained as the speaker. The course was arranged for six evening meetings, one a week, with both lecture and discussion periods. The meetings were held in the "garage" lecture room of the Matchless Electric Home, on Wilshire Blvd., which has parking space available. The meetings began on Jan. 18 and were held successive Thursday evenings.

Authoritative information was prepared for each session and, wherever possible, demonstration material was added to supplement the talk. A guest speaker was added for the last two subjects because of his special knowledge.

"Because the six meetings were limited to two hours' duration," said Howard Burdick, supervisor of dealer relations for the Department of Water & Power, who had charge of the meetings. "It was possible to cover only the most important points of each subject. It was really most successful and we intend repeating the course with more extensive material at some future date."

There was consistent attendance of 85 retail stores, with a total of 144 persons enrolled. The announcement mailing was sent to 220 dealers. The group was unanimous in its desire to repeat the course, going more into detail of the subjects covered briefly in the first course.



Walter Elieson, Department of Commerce, Los Angeles, was instructor at dealer refresher course held at the Matchless Electric Home by Distributive Education

● VERD-A-RAY lamps, the Federal Trade Commission has enjoined from making most of its claims in the advertising of its green tinted lamps, according to an FTC release. Save Electric Corp., maker of the lamps, has accepted the cease and desist order. Among the claims which it must not make are that its bulbs conserve vitamin A in the eye.

● FRIGIDAIRE views the home freezer market potential with an old and experienced eye. P. M. Bratten, general sales manager, advises a few grains of salt with the rosy predictions of volume. His estimate is a probable 350,000 units per year instead of some of those running up into the Amos and Andy figures. With 132 manufacturers making them, says he, the competition is bound to be hectic. Other family wants, such as a new car, new home, new radio, etc., he also warns, may outweigh the desire for a freezer and likewise a released food distribution industry may have a big effect on the comparative need for a freezer cabinet.

● WESTINGHOUSE voluntarily stopped its production of electric irons when the turn of events in the European war demanded full concentration of manpower on stepped-up war production.

● PHILCO has told its stockholders that it plans to expand its product line to make household freezer chests when it can resume manufacture of civilian goods.

● PREMIER vacuum cleaners will be distributed, when available, one to every dealer before any dealer gets two cleaners, according to recent policy announcement. This is to give each dealer a sample to demonstrate and display and from which to accept orders for future delivery.

● HOUSE HEATING by electricity is invited in the announcement made to its customers of a new rate reduction in February by the California-Oregon Power Co. The rates were equalized for both rural and urban customers, and average about an 11% reduction for domestic and 14% for commercial customers. "The new rate," the advertisement states, "is expected to open the door for electric house heating." With exceptionally high saturation of both ranges and water heaters, the service facilities to serve additional load from house heating will not require much enlargement of facilities or home wiring.

● A. O. SMITH CORP. will bid strongly for the water heater business of the future, it is indicated by advance publicity from this steel fabricating company which began with baby buggy parts in 1874 and has made automotive frames, tanks, tanks cars and pipe. Developing a glass lined pipe for the food industries, and tanks and tank cars, it will make glass-lined steel electric water heaters. The water heater is a two-element, two thermostat, fiberglas insulated standardized product.

● MONARCH ranges offers its dealers a "Peace Plan" folder to give to their customers for the keeping of home and kitchen plans and ideas for the future. Inside the letter-sized file folder is an illustrated brochure, which gives a number of floor plans and pictures of attractive kitchen layouts.

Urged to Look Before Leaping Into It

Booklet prepared to advise service men and others who may wish to start in the appliance business

TO forestall the possible failure of the hundreds of newcomers seeking entry into the electrical appliance retail business in its territory, the Bureau of Radio and Electrical Appliances of San Diego County has just issued 5,000 copies of a booklet entitled, *Appliance Retailing Outlook in San Diego County*.

Designed to serve as a guide for returning service personnel and others who may be planning to establish retail appliance stores in San Diego County, the booklet aptly summarizes the electrical appliance situation and provides material for serious thought for newcomers.

"The establishment of any new business," says the booklet, "is a most important step in the life plans of those involved . . . so important is this step that we feel obligated to place at the disposal of those planning to open appliance stores all the factual information available as to the outlook here. We are prompted to offer this information in part because we fear that the opportunities in the field of appliance retailing, promising though they appear, have been overglamourized."

This overglamourization is due to people being more appliance conscious simply because appliances aren't to be had. The backlog of demand has been publicized to the point where an unreasonably high per capita appliance purchasing potential has been estimated. Because the national average of mortality among dealers is known to be high, many have been led to believe that opportunities for entry into the appliance field would be good. The role of electronics in the war also has tended to glamourize the outlook of the appliance business.

Referring to the extent these factors have been at work in San Diego, the booklet says:

"We find that the expressed desire of persons to enter this business seems to be vastly higher here than in other sections of the country. To the best of our knowledge, upwards of 400 persons have expressed the intention or desire to open appliance stores in San Diego County. While we are tremendously optimistic over the future of the appliance industry in all its phases of production and distribution, we see nothing short of failure or disillusionment for most of the 400, should they follow through with their plans to open retail appliance businesses in this county."

Reasons for this belief are based on (1) San Diego's dealer loss has been negligible, as compared to 30% and 40% numerical loss of dealers elsewhere. What few firms did go out of business have been more than replaced by newcomers. While it is true that San Diego's nearly doubled population warrants additions here and there, by no stretch of optimism could 400, or 200, or even 100, new appliance businesses be profitably established within the first year of postwar production; (2) Initial production of the first appliances will be so limited as to be insufficient to maintain dealerships on appliance sales alone. Existing dealers, the booklet points out, have long since adjusted themselves to other types of merchandising.

Existing distributors have obligations to existing dealers to keep them going until appliance stortages ease up, thus rendering it nearly impossible to consider new franchises for some time. That the matter of franchises has escaped the attention of some of these 400 dealers expecting to enter the business is revealed in the booklet's statement:

"There have actually been several instances called to our attention in which persons have bought property, tied themselves to agreement to buy or lease, *before* concluding franchise arrangements with some distributor or manufacturer's representative."

And, finally, the booklet warns that many prospective dealers are unduly optimistic over the continuing public demand for electrical appliances after production is resumed. The day will come "when we will find ourselves in a buyer's market where, for the first time in several years, salesmanship and sound merchandising will again become of prime importance."

To those who firmly believe that over the long pull the electrical appliance business will bring a profitable future, the booklet offers this concrete, helpful advice:

"We can think of no more constructive suggestion for anyone planning to enter this business for the first time than that of actually gaining first-hand knowledge of some of the problems involved. Furthermore, a solid experience in selling is going to prove an indispensable asset when the time comes that the product we have for sale will no longer be taken away from us but will have to be sold.

"Also, it is our belief that the matter of having knowledge of how to service appliances that we may someday sell from our own stores is important. This, too, could be gained without risk of one's own capital while working for or with someone already established. Few men who have had a smattering of radio experience with electronic equipment in the armed forces, and who desire to open their own shops, have any idea of the capital required to maintain an adequate stock of parts and supplies for servicing only, let alone considering the capital requirements for a business that contemplates the selling of radios and perhaps other appliances as well. By gaining the practical experience of working for someone else, such knowledge can be gained the easy way, without loss of capital, owned or borrowed."

Easy Does It

Ben Cole, proprietor of the Cole washing machine and vacuum cleaner repair agency, 3020 University Ave., San Diego, has been awarded a franchise for distribution of Easy washing machine parts in San Diego county. This is the first direct independent distributorship for washing machine parts to be set up in San Diego, Easy parts being handled formerly from the Los Angeles office. Cole will handle outside contacts and his partner, Art Shapiro, will manage the inside service work. Announcement of the franchise award means that Cole's will be out of the retail picture postwar.

Authorized Easy washing machine dealers for San Diego county are: H. L. Benbough Co., Burnett Furniture Co., Parmelee-Dohrmann and Walker's, all of San Diego city; Churchill & Cassou of Escondido; Strand Radio of Ocean Beach; Harrold LeFlam of Oceanside; Erling Rhode Plumbing of La Jolla; Lakeside Supply Co. of Lakeside; C. M. Beall and the National City Stove Works of National City; R. M. Swearengin of El Cajon; and Donaldson's of Encinitas.

● NESCO officials, Alfred J. Kieckhefer, president, and Michael N. Brady, vice-president in charge of sales, were on the Coast last month to confer with Thomas E. Green, Western division manager, at the Western Merchandise Mart, San Francisco. Redesigned products, which include roasters, ranges and heaters, are to be offered as soon as the company's war production can be converted back to kitchenware, Kieckhefer declared.

"Not for Sale"

White House whets appetite for future appliances

BOTH a dream of the good old days and a vision of things to come was sprung on the San Francisco public by the White House, Raphael Weill & Co., department store, when it held a "not for sale" of electrical appliances in four of its large Sutter St. windows early in March. Exhibitors models of refrigerators, electric ranges, vacuum cleaners, washing machines, irons, toasters, mixers, freezer cabinets which had been shown to the trade only at the Western Merchandise Mart a week or two previously, were attractively displayed and tied in with a war bond sales appeal.

"Not for sale—we can't buy them either BUT—war bonds will bring them back!" a sign told the crowds whose mouths watered for the long nonexistent appliances seen displayed for the first time since 1942. A smaller card said. "Buy war bonds—and keep them—for Victory! Come in with your questions, get your gift booklet, buy your war bonds—in our housewares department."

The store reports gratifying results. Many customers visited the housewares section where bonds were bought at a large bond booth. Literature was given, a bond booklet to keep bonds in for after-war purchases, and many listed their wants on a list for early purchase of wanted appliances when available.

Twenty manufacturers participated in the exhibition, among them Manning Bowman, Chicago Flexible Shaft Co. (Sunbeam), Ironrite, Casco Electric, Apex-Rotarex Co., Bendix, Norge, Westinghouse, Eureka cordless iron, Toastmaster, Conlon, Waverley irons. Large advertisements by the White House in newspapers and the *Shopping News* also told the same story of its Not-for-Sale and urged the buying of bonds.

Promote the Positive

Because it is difficult for the more than 200,000 new wartime residents to appreciate peacetime living conditions of San Diego, the San Diego Gas and Electric Co. is running a series of institutional ads pointing out the city's outstanding cultural and recreational attractions.

One by one each ad portrays some typical San Diego sport, pastime, or diversion that the public can no longer enjoy because of wartime travel restrictions or the government's military occupation of certain areas. Featured are the world's largest outdoor organ, Balboa Park's art gallery and science museums, the ocean caves of Sunset Cliffs and La Jolla, the beaches, the deep sea fishing and mountain resorts.

The ads inviting new residents to make San Diego their home after the war are a part of Sales Vice-President A. E. Holloway's postwar plan to expand San Diego Gas and Electric Co.'s facilities by attracting a greater population to this area. The ads have been cleverly prepared by advertising superintendent F. M. Raymond.

The first ad offering a free booklet describing peacetime living conditions drew an unprecedented response of 545 requests.

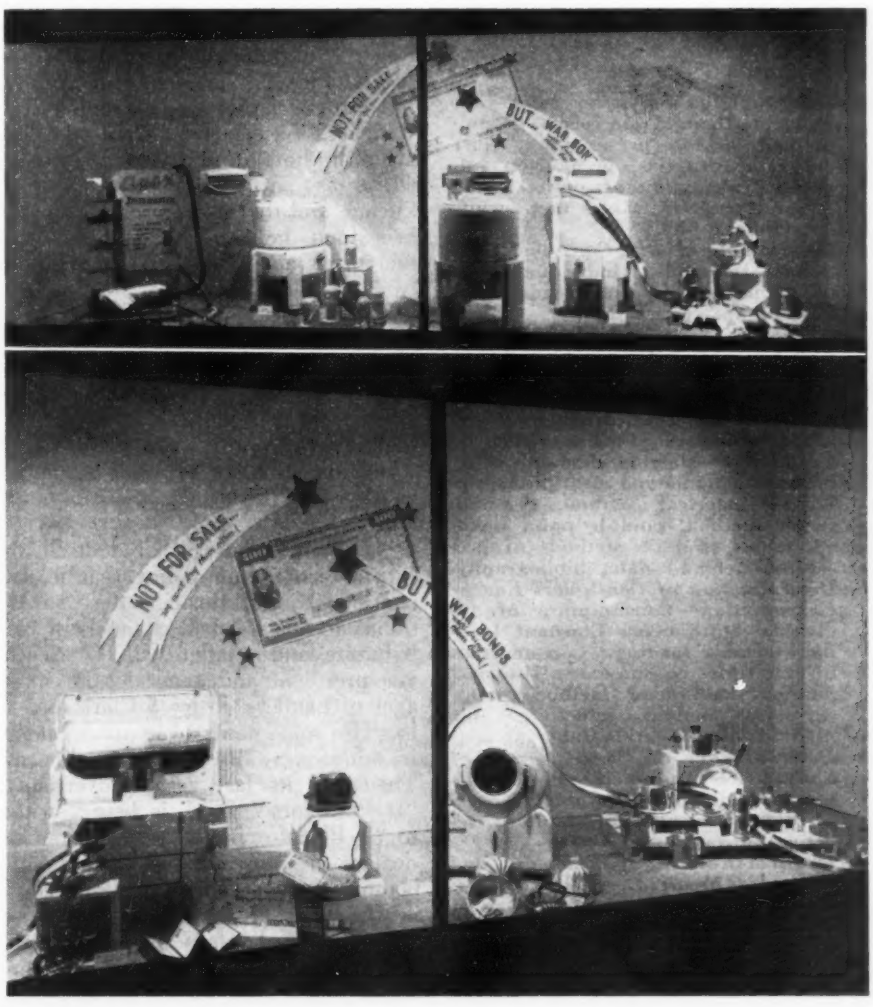
● AMANA SOCIETY, a 100-year old religious organization of Waterloo, Iowa, will market a line of home freezers. Bauer-Knapp of Hollywood, Calif., has been appointed factory representative in California, Oregon, Washington, Idaho, Utah, Nevada and Arizona.

● F. L. JACOBS CO. of Detroit, an automotive parts maker, will step into appliance production with a line of washers and other appliances, it has announced. A former Bendix Home Appliance man will head its new division. An automatic washer is in prospect.

● THERMADOR, in characteristic, terse Bill Cranston words, with a little folder sent out to the appliance trade, tells in less than 60 seconds of text and cartoons what it has been doing these war years, and ends with this declaration of postwar product policy: "We are going to leave the gadgets to the guys that are learning. We are sticking to the sound and sensible, which has always characterized products bearing the Thermador name."

● EUREKA not only will have a cordless electric iron and a complete housecleaning kit, but has now announced that it will make an electric garbage disposer unit for sinks. Some production on cleaners and cordless irons began but was stopped when the armed services stepped up war material orders from this company's factories recently.

Two of four attractive windows displaying long absent appliances "not for sale" and advocating war bond buying to purchase when they are again available



Short-Cut Book

Edison helps power sales men save paperwork time

BECAUSE the power salesman must spend about 30% of his time in computations and paper work, all of it necessary of course, the Southern California Edison Co. general sales department is going to cut down the time necessary to handle such data and thus release more of his time for calls on customers. How it plans to do so contains an idea which other sales managements may wish to employ too.

In the Edison company, according to George N. Hawley, manager of commercial and industrial sales, four times a year the power sales staff review the status of all industrial customers and compute which rates will give them the best service. This requires considerable computation and reference to data. Therefore to place in their hands a "method book" containing all necessary information and as many short cuts as possible, it was felt, would reduce by half the amount of time spent in such work.

An outline of the contents of the method book is indicative of the kind of data it contains:

Terminology

1. ***Determination of power rate*—General, rate theory, rate forms, graphic methods of rate presentation, short-cut rate formulas, break-even rate points, calculation of power factor discount, reactive tables and formulas, bibliography.**
2. ***Determination of Consumer Demand*—Demands of individual pieces of equipment—Constant loads: Deep well pumps, rotary blowers. Variable loads: Fans and blowers, compressors and ice machines, cranes, hoists and elevators, conveyors, machine tools, residual heating equipment, arc furnaces, arc welders, resistance welders. Characteristics of a-c motors—starting demands. Demands of plants and multiple equipment—Historical method, demand-factor method, point-by-point method, tables, graphic methods of presenting demand data, bibliography.**
3. ***Determination of Consumers Energy Consumption*—Consumption of individual equipment: Constant loading, variable loading. Consumption of multiple equipment: Historical method, load-factor method, point-by-point method, tables, graphic methods of presenting data.**
4. ***Determination of Power Factor of Consumer's Equipment*—Power factor of individual equipment, overall plant power factor, monthly reactive kilovar-hour.**
5. ***Determination of Efficiency and Cost of Operation*—Load factors: Daily, weekly, annual. Efficiency of individual machines. Cost per unit of product. Tables.**

In order to supply some of these facts and tables considerable research will be necessary. For example, Edison intends to develop a table showing the per cent cost of purchased power to the value of the product. The Edison Electric Institute has a table showing the kwh. per dollar of product for a long list of manufactured products, but Hawley feels that it will be more useful if converted to units of product, such as per ton of steel, pound of rubber, etc. This should remove the emphasis from the power rate and put it on plant efficiency where it belongs.

As other required data seems necessary, it is planned to add to the method book. Possibly other sections may be needed. One on wiring efficiency may have a bearing and become a useful tool in the power salesman's method book. This book is to supplement the Power Sales Manual of the EEI, with which each salesman is equipped.

A highly successful continuous training process for the power sales force is being operated by the Edison company, about which a story in detail is promised for an early issue.

● KELVINATOR has made available to its dealers a new 32-page booklet on kitchen planning for distribution to prospects who intend to build houses as soon as materials become available. It illustrates six types of kitchen and cleverly includes in each plan some special idea not anywhere else found but quite desirable as an added convenience. As an example, in one plan a built-in hotplate is suggested, mounted on a partition counter between kitchen and dining room, on which to keep foods hot for extra servings. All the ideas, many of them grouped on two pages by themselves, are practical and workable. Wiring for adequate service is advocated and the company's products are illustrated as well. Kelvinator is sampling television as an advertising medium in a series it is using experimentally from WABD, in which the "society of amateur chefs" enact a cooking program.

● UNIVERSAL has declared itself on future distribution policy that it will continue to sell through the conventional and established channels of distributors and retailers. B. C. Neece, vice-president and general sales manager of Landers, Frary & Clark, promises also some new and improved items in addition to its former appliances. Theme of its last year's advertising, "U Plan for V Day" is being swung to "U Plan for Better Living", and its dealers are now offered a new store planning service called "moderneering" in which Richard M. Bennett, architect, has developed plans in cooperation with manufacturers of paint, glass, linoleum, insulating materials, store fixtures, and Sylvania Electric Products Inc., for lighting, and National Electric Sign Mfg. Co., for signs, and Carrier Corp., for air conditioning, to assist dealers in the modernization of their stores. The plans are arranged in two steps, for three basic types of store.

● HOTPOINT has announced that it will add automatic washing machines and electric tumbler dryers to its home laundry line, come postwar. These previously included the standard types of washer and ironer only. The planning service of Edison General Electric Appliance Co. which previously covered plans for kitchens, will embrace plans for home laundry rooms as well, or will develop plans in which the automatic laundry equipment may be made a part of the all-electric kitchen. Importance of the water heater is emphasized by the automatic laundry, Hotpoint declares.

● REGINA Corp.'s revolutionary lightweight vacuum cleaner, the Electrikbroom, is being distributed in northern California by McCormack & Co., at the Western Merchandise Mart. This distributor also handles Electromaster ranges and water heaters and Coolerator ice and electric refrigerators. Dwight F. McCormack, formerly sales manager of Sherman, Clay & Co. music stores, is its owner. He also distributes Majestic phonograph records.

● TELECHRON is looking for more jobs for its clocks and is offering manufacturers of various devices electric clocks with timing controls for a great variety of applications. Among these are automatic tuning of radio sets to preselected stations at predetermined times. A whole day's program can be set up in advance, by 15-minute intervals. More expensive sets may feature it.

● NEON Products of Western Canada Ltd., at Vancouver, B. C., plans to manufacture radio sets and electric irons when its wartime product program is completed. Already some samples have been turned out and production will begin on civilian production as materials and labor become available.

● EASY Washing Machine Co., in a large brochure, *What Can Easy Offer You That No One Else Can?*, has renewed contact with its dealers and distributors and told them what its own plans are for the future.

● GENERAL MILLS, makers of flour and grain products, intends to manufacture and market coffee makers, electric irons and pressure cookers after the war.

Dealers—

Roll Your Own Planning III

The Root of It ALL—Finances

LIKE the control center of the admiral on a flagship during a battle, your office is the control center of your business. And your money is what makes it all perform. Therefore there's nothing in a business so important as the adroit handling of finances. If it seems dull, think how unnecessarily exciting it might be if it went wrong. Besides being ready to handle troublesome things like income tax and other government forms and reports, knowing just where you stand gives you the "intelligence" you need to direct your selling, buying and operations.

As a suggestion to assist in well organized thinking and analysis of your own situation, the following are well worth looking into—

Your business' state of health

What do you owe—what's the indebtedness, in other words?
- —What part of it takes first importance—primary debt?
- —What part is secondary, or can wait a bit?

What's owed to you—your accounts receivable?
- —How many are current, and how are collections?
- —How many are term contracts and how do they stack?
- —How many are dubious or uncollectible and should they be written off?

How much cash on hand?
Any surplus? What is best to do with it?
- —Do you want to keep it usable—liquid?

Talk over with your banker possible short-term investments.
- —Credit reserves can be built up by buying negotiable securities perhaps?

That will give you the picture of how things stand now. But it is also a good idea to take a look at future possibilities.

Of course a dealer has to govern his own policies with those of his competition in mind, but it's not too early to begin finding out what's best for your business in the plans of others.

Take appliance financing for instance—

Who's going to carry your paper? Have you checked in with:
- —Banks, to find what their new credit programs contemplate?
- —Commercial finance companies with revised programs, too?
- —Manufacturers' own financing agencies or those closely associated with them and having programs that fit their own product sales programs?
- —Your local utility, perhaps it has a plan worth considering?
- —FHA, to find out whether it may again finance appliances, at least those affixed to the building?
- —Other government agencies, such as EF&HA, to find out if they will be in the field again?
- —Or will you carry your own paper and earn the profit on financing yourself?

Financing wiring and equipment—
- —Have the banks any plan you can use?
- —How about FHA?
- —Has the utility some plan in this respect?
- —Has the manufacturer, through his distributor, perhaps?

Rewiring needs a financing plan, too. May be worth while checking to see what plans may be cooking for a lot of this work.

And while in the mood, it may be smart to do some thinking and come to some conclusions about what *your* policy ought to be on

Terms

How much down payment should you get?
How long a contract? For major appliances, for small appliances?
What reserves should be kept against credit losses and dead beats, repossessions and service cost?
What sort of a policy should you adopt on trade-ins?

What you discover after such a financial health checkup ought to be good for the steering of your business. Make you better prepared to pitch into the business of the future and come out ahead. After all, that's what you are in business for.

Prepared by Pacific Coast Electrical Association Planning Committee

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
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War Home Salvage

WHEN the war ends there will be in the West 150,000 to 200,000 relatively new houses more than there were before the war, houses built and sold under FHA and war housing allotments of materials. This does not count the so-called temporary mass housing which is to be removed, according to promise.

If the homes built prior to the war were inadequate in electric outlets and circuits, these war houses are even more so. Under limitations on materials none of them have more than 21 outlets, counting switches, some only 17. Because they were built as permanent housing and sold to homeowners, these houses will continue to be lived in and used. Unless something is done about the wiring installed in them, these 200,000 homes will have a permanent low ceiling on electrical convenience and usage. They are doomed to be a bottleneck both to their owners, in opportunities to make use of electricity, and to the industry in marketing current-consuming devices to them.

The problem is not hopeless, by any means. It requires initiative and enterprise to do something constructive about it. These houses will not be rewired by themselves. Homeowners may try to get convenience by running cord all over the house if no better program is offered them on acceptable and appealing terms. But surely the vaunted enterprise of the industry is equal to the challenge of this situation. Here is something worth some post-war planning in a realistic way.

No Little TVAs

ONE of our Western contemporaries, commenting upon the sudden influx of legislation in Congress for federally dominated developments like the TVA on practically every rivershed in the country, asks pertinently, "Who wants these River Authorities?" Insofar as the Far West is concerned, the answer is "only the New Deal bureaucrats, the TVA type social workers, Secretary Ickes and the President." No one who appreciates the relationship between water and the economy of the Far West wants any river authorities. Nor do those who look with growing fear upon the increasing usurpation of states rights.

As proof of the growing repugnance of this region for any little TVAs, there may be cited the resolutions from groups large and small protesting to Congressmen against the Columbia and the Missouri River Valley authorities. Reclamation association representatives from Oregon, Washington, Idaho, Wyoming and Montana recently opposed the proposed CVA bill, contending that present federal and state agencies were well qualified to proceed with the development of the land and water resources of the Columbia River Basin. In California the state legislature is seeking ways and means for taking over the Central Valley project rather than have this development incorporated into a river authority.

Stripped of all pretense, the doctrine of regional economy on which the river authority program is built is simply another form of socialism. That is the basic pattern of the TVA. Proposals to extend the TVA pattern on the grounds that it has been successful is simply to ignore what the authority has taken away from that region. Our contemporary says "TVA has succeeded in embarrassing the tax structure of state, county and city governments of the Tennessee Valley. It has succeeded, with its flood control dams, in *permanently* flooding 730,000 acres of reservoirs—an area larger than that which the Corps of Engineers estimated would be inundated by a flood that would occur once in 500 years . . . TVA has succeeded in acquiring Paul Bunyan size and octopus-like power. Original estimate for the project was $200,000,000. As of now the investment is just short of one billion dollars."

Rather than see its resources placed in the hands of independent federal agencies like the TVA, the people and the industries of the West would prefer to see them administered by the agencies now responsible. Flood control, power development and irrigation are engineering problems.

The Army Engineers, the Reclamation Bureau and the Federal Power Commission, along with state agencies, can handle them adequately. Such experts as these need not be supplanted by a group of social workers.

No Time For Dispute

PUBLIC bickering such as has developed between the Army Engineers, the U. S. Bureau of Reclamation and California state authorities over the diversion of the Klamath River won't enhance the public standing of any of these agencies. The controversy apparently stems from a jurisdictional dispute over control of some of the proposed postwar flood control and power developments in the Far West. Extension and expansion of the controversy will play directly into the hands of those who would see control of water and land resources turned over to regional valley authorities. If the present agencies cannot work cooperatively, then Congress will have no other recourse except to adopt the plans of the valley authority advocates.

Sorcerer's Apprentices

LISTENING to the parlor, classroom or platform talk of the socially minded, it all sounds so simple to reform the world and correct all its wrongs. Along comes a depression and a socially minded administration and these theorists are given the reins to have a try at driving the twenty-mule team economy. A war comes along and even dispossessed business men are swept into war agencies and bureaus to control the destiny of industry.

Then things begin to happen. The rein on the gee side to one mule is pulled up a bit to try to keep the critter in line, without pulling up on the haw rein corresponding and all hell is loose. First thing, the whole team is snarled up and ready to break loose and run away. It takes consummate skill to handle such a team, even if it looks easy.

So it has been with our economy. It looked easy to reform it, to regulate and control it, to hold the wild horses of inflation in check yet put their energy to work drawing the war load. But as one business man who was drafted for a regulatory job said after he had finished and returned to his business, "Even those of us with business experience and who should have known better had no idea of the forces that would be set in motion by a simple-looking bit of regulation to try to stop a simple-looking leak."

In a climate of freedom the various forces oppose and check each other, achieving a balance that is fluid and variable but in the long run works best. Possibly the solar system and the stars stay in their orbits by just such counter-balancing forces. To interfere with any of the parts of a free economy, no matter how beneficent the purpose, is to tinker with delicate balances which have been adjusted automatically each to all the others.

After all it amounts to colossal human egotism to feel that any man or group or party can manage an economy better than nature does it. This is a lesson the universities from which the theorists in political "science (?)" and economics are ground out could well teach as a first principle. As it is, all these sorcerer's apprentices succeed in doing is to sweep up so much water that it may drown the country before the thing can be stopped.

With an international conference to set up specifications for world peace due to start in San Francisco next month it is to be hoped that the planners do not forget that principle either. Not even Joe Stalin is omniscient enough to decide and direct the business of the world. It is to be hoped that as much freedom as possible is given to nature to do its own balancing.

HOW can we do the postwar job? What rules must we follow? What are the obstacles we must overcome? First we can do it by going back to the first principles in business practice. We must get over ponderosity of the corporate joints. In the old days when a business was still a one-floor operation, production, advertising and selling got together to plan every move. When the business developed and several stories were added to the building and departments distributed on various floors, the only times some of these groups met each other was in the elevator coming in or going out. That day has gone forever, from here on it will take one-story thinking to keep many stories busy. As far as rules go, there are just about two rules to successful salesmanship. One is the rule of a fair trade—the rule which demands a mutual exchange of values for both sides of a transaction . . . I like to think of the future in terms of "Let's Trade" because I think the word "sell" has become one-sided in its connotation. It has gained a certain negative meaning today which is best expressed in sayings such as "Don't try to sell me that," or "He's trying to sell us something," or again, "You can't sell that to the American public." As children, however, we said to each other, "I'll trade you this agate for that slingshot." Trading is two-sided selling. That's a good rule for selling domestically or internationally in the world of tomorrow.—Charles B. Brown, director of advertising, RCA Victor Division, Radio Corp. of America.

At the Conferences

Business Development program announced

OF even more than customary value will be the Pacific Coast Electrical Assn. conferences, to be held in Los Angeles at the Ambassador Hotel on June 21, and on June 28 in San Francisco at the Fairmont Hotel. The guidance committees of all three sections of PCEA are arranging programs which will be of exceptional wartime interest and information to all who attend.

The annual meeting of the association will be held at the Los Angeles conference, when officers will be elected for the new administrative year that starts July 1.

Details of the programs will be given in next month's ELECTRICAL WEST.

Available at present is information on the excellent program to be presented before the gathering of the Business Development Section. Four nationally prominent speakers will appear on the program, which will be identical for the northern and southern meetings.

A. H. Schanuel, secretary of the Indoor Climate Institute, will present information on this organization and its promotional plans that embrace all aspects of air conditioning.

C. E. Greenwood, commercial director of the Edison Electric Institute, will speak on the subject of the reorganization of the commercial committees of EEI, and its national promotional programs.

Dr. D. K. Tressler, director of the Consumers' Institute, General Electric Co., will speak on the domestic future of frozen foods. A former technical head of a prominent frozen foods concern, Dr. Tressler is a foremost authority in this field.

Miss Mary Webber, home lighting specialist, Lamp Department, General Electric Co., will discuss future trends in domestic lighting.

At the southern meeting, D. P. Wheelock, California Electric Power Co., Riverside, and E. W. Meise, San Diego Gas and Electric Co., will preside. At the San Francisco meeting, the speakers will be introduced by Frank Jordan, air conditioning specialist, Westinghouse Electric and Mfg. Co; B. M. Tassie, manager, Pacific district appliance sales, General Electric Co.; Miss Marguerite Fenner, home economist, Pacific Gas and Electric Co., and R. E. Fisher, vice-president in charge of public relations and sales, PG and E.

Members of the guidance committee of the Business Development section are: Chairman, Milo Cain, Coast Counties Gas and Electric Co., Santa Cruz; vice-chairman, H. C. Rice, Southern California Edison Co., Los Angeles; Walter E. Carlson, Lamp Department, General Electric Co., Oakland; T. W. Christensen, Pacific Gas and Electric Co., San Francisco; H. A. Jandt, Allis Chalmers Mfg. Co., Los Angeles; W. P. L'Hommedieu, Westinghouse, San Francisco; E. W. Meise, San Diego Gas and Electric Co.; C. L. Moore, Chicago Flexible Shaft Co., Los Angeles; B. W. Reynolds, PG and E, San Francisco; B. M. Tassie, General Electric Co., San Francisco; D. P. Wheelock, California Electric Power Co., Riverside.

Highway Light

A. F. Dickerson, designer deluxe of world fair lighting, paid the West a visit during March to do what he could to save lives with street and highway lighting. In his position of national authority on the subject, he did a great deal for he talked with municipal and state officials, highway engineers and utility executives. Then to public meetings of chambers of commerce and to industry meetings of electrical clubs and IES, he gave special messages which will furnish them with verbal ammunition to further the same cause.

Dickerson, who is manager of the lighting division at General Electric Co., Schenectady, a Texas A & M graduate and recently made a doctor of engineering by that college, served as resident engineer for the Panama-Pacific International Exposition in San Francisco, 1915, played an important part in lighting the Brazilian Centennial in 1922, the Chicago Century of Progress in 1933 and the lighting of the Golden Gate International Exposition in 1939-40.

In Spokane he addressed both the construction and industry committee of the chamber of commerce and the Spokane Section AIEE. In San Francisco he addressed a combined meeting of the San Francisco and East Bay Electric clubs, March 12, and March 13 the IES, at which he discussed the IES street lighting code, being a member of the national committee. He predicted that levels of illumination on the street would be raised and discussed frankly the application of fluorescent lighting to outdoor illumination as problematical.

San Francisco Electric Club, with appropriate ceremony, inaugurated Freeman Scharr, Bryant Electric Co., as president and returned E. A. Long, Pacific Gas and Electric Co., president during the past year, to the ranks, at the annual meeting, March 5. Ken Ryals, Stone-Ryals Co., was master of ceremonies, aided by a table full of past presidents. Other meetings of the month of note were those at which Charles B. Brown, advertising director, RCA division, Radio Corp. of America talked on *Let's Trade*, and Dr. A. F. Dickerson, manager of the General Electric Lighting Division, spoke on traffic safety lighting.

Frank Jordan, refrigeration engineer, Westinghouse Electric & Mfg. Co., addressed the Electrical Maintenance Engineers Assn. of Southern California, at its March 21 meeting. With slides for illustration, Jordan discussed the inner working of refrigeration systems, then talked of building air conditioning. He described reverse-cycle air conditioning whereby properly designed cooling systems for warm weather can be reversed in operation to produce heat in cold weather. Operating costs, he said, were practically on an equal basis with separate gas heating and refrigerating systems. A moving picture short was shown also to picture many new uses for refrigeration in wartime industry. A new feature, the EMEA Electro-Factists, a broadcast of recent scientific developments, was presented by Henry Bush and Henry Ledeboer.

School officials, architects and lighting specialists were present at the March 2 meeting of the Rocky Mountain Chapter, Illuminating Engineering Society, to hear R. D. Bradley, nationally known illuminating engineer of the Day-Brite Co. staff. Bradley asserted that higher lighting intensities in classrooms are essential to better vision and improved mental development of children, citing the new appreciation for proper illumination which has resulted from the example set in plants producing war materials. As a consequence of increased interest in lighting innovations, the IES chapter will conduct a series of lighting forums; seven before June 7.

March meeting of the Southern California Section IES was held at Edison auditorium and was a joint meeting with the Governmental Building Managers Assn. and the Southern Section of the California Association of Public Schools. Speakers were Dr. Charles Bursch, chief of the Division of School House Planning, California State Department of Education; Charles Gibson, assistant to Dr. Bursch; Henry S. Wright, architect, who talked on natural lighting; Clayton Gibbs, consulting engineer; Edward Reynolds, superintendent of maintenance, City of Los Angeles Board of Education; Frank Wagner, Wagner-Woodruff Co.; Walter Alden, lighting specialist, Westinghouse.

Let Us See, the official film just released by the Illuminating Engineering Society was presented to the East Bay Electric Club, Oakland, by Phil Carlstroem, Sylvania Electric Products Inc., March 26. At the previous meeting, W. A. Cyr, associate editor, ELECTRICAL WEST, presented his parody talk, *The Dream Home of the Future*. The club joined with the San Francisco club to hear A. F. Dickerson, General Electric Co. lighting division manager, March 12. Plans for the annual golf tournament and dinner, May 25, at Orinda country club, were announced by R. E. Will, president.

Illuminating Engineering Society, Oregon chapter, held two meetings in March, the first March 14, the other March 30. At the first Herbert A. Hagen, E. L. Knight Electric Co., electrical contractor, talked on the maintenance of fluorescent lighting equipment and of lamp replacement. The special evening meeting March 30 was the occasion for the first showing of the IES official educational movie, *Let Us See*, and Dr. Leighton E. Roy, member of both IES and American Optometric Assn. and visual consultant for several local industrial plants, spoke on *Visual Problems in Industry*.

Propose Sub-Chapters

A plan to subdivide the chapter into even smaller units in order to hold local meetings and overcome the difficulties of transportation, was discussed at the March 2 meeting of the Puget Sound Chapter, International Association of Electrical Inspectors, held at Tacoma. A proposal to form divisions of the chapter in the larger towns, which could hold meetings for study purposes each month, had been submitted to the executive committee of the Northwestern Section and a tie vote held it up. After discussing the merits of the plan, it was voted to resubmit it to the executive committee.

At the election of officers, Thomas C. Stewart, state electrical inspector, State of Washington, Seattle, was appointed chairman; C. C. Bradshaw, principal electrical inspector, 13th Naval district, Tacoma, vice-chairman; and C. S. Alger, associate engineer, Puget Sound Power & Light Co., Seattle, was reelected secretary-treasurer. Ray Larrabee, Underwriters' Laboratories, Inc., Seattle, has been chairman during the past year.

Other matters of importance brought up in this meeting were support of the sales-control legislation pending before the state legislature, participation in the Electrical Safety Week, April 22-28, appointment of John Algeo as chairman of a planning committee, and thorough discussion of a recent disastrous fire in a four-story apartment building in Tacoma made worse by a delayed alarm. Legislation to require suitable alarm systems in such buildings is under consideration in the legislature, and this, too, was discussed.

Model Ordinance

Finding that it is permissive under the International Association of Electrical Inspectors by-laws for a chapter to sponsor the model electrical ordinance with some modifications from the National Electrical Code, the Southern California Chapter, at its March 21 meeting at Alhambra city hall, selected a new committee to prepare such an ordinance. Chairman Jesse Ross, electrical inspector, San Bernardino, appointed Kenneth Howard, South Gate, chairman; E. E. Larson, Riverside; J. H. Crannell, Glendale; Charles W. Donohue, Orange; W. P. Shigley, Pasadena; O. D. Butterfield, Torrance; and Charles M. Morrison, Long Beach. It is to make a progress report at the next chapter meeting at Recreation Park clubhouse, Long Beach, May 2.

Other topics discussed included: Dissatisfaction with SN wire under field conditions, some of it badly off center, resulting in failures when pulled into raceways and around bends; whether No. 10 wire should be permitted for services because of the unavailability of No. 8 even on priority; grounding of gasoline engine driven generators to supply power for tools and lighting on construction jobs; the proposals of Article 240 committee to have Type-S fuses returned to a mandatory status, with standardization on 20-amp. fuses for No. 12 wire, and 30-amp. for a new No. 9 wire, eliminating 25-amp. fuses.

EL of U Directors

The following were chosen directors of the Electrical League of Utah. New officers were announced last issue.

Contractors—Mark Strand, Strand Electric Co.; Harry Hall, Capitol Electric Co.; Jack Jacobs, Apex Electric Co.; Kimball Vance, Vance Electric Co.

Dealers—J. Vern Sharp, Sharp Electric Co.; O. R. Bigelow, Paris Co.; K. E. Smith, Kenneth E. Smith Co.; J. T. Underwood, Smith Electric Co., Ogden.

Manufacturers — Mark Austin, Chicago Flexible Shaft Co.; Walter G. Wood, American Steel & Wire Co.; Stanley Johns, Westinghouse Electric Co.; Lester B. Johnson, General Electric Co.

Utilities—W. A. Huckins, Utah Power & Light Co.; C. A. Wolfrom, Utah Power & Light Co.; Ora H. Barlow, Mountain States Telephone & Telegraph Co.; W. R. Hancock, Mountain States Telephone & Telegraph Co.

Wholesalers—Paul DeVine, W. H. Bintz Co.; John Longdon, Westinghouse Electric Supply Co.; Howard Price, Salt Lake Hardware Co.; Sidney Cooper, Graybar Electric Co.

● Electric Club of San Diego has elected the following officers for 1945: President, George R. Gray, San Diego Gas & Electric Co.; first vice-president, Oscar G. Thompson, General Electric Supply; second vice-president, Marvin Musgrave, San Diego Gas & Electric; secretary-treasurer, Don Sylvester, San Diego Gas & Electric. Directors named at the same time are: William W. Powell, Coast Electric Co.; Bart A. Murray, Electric Supplies Distributing Co.; A. H. Jewell, Graybar Electric Co.; F. D. Ide, Don Lee Broadcasting System; F. Porath, San Diego Gas & Electric.

A new roster, cross-indexed as to names of individuals and company affiliations, has been issued by the Electric Club of Los Angeles. With a spiral binding and in pocket size, it is a handy information guide to the electrical industry in the area. It represents several months' work by Ethel Sanborn, executive secretary of the club. Industry talk of the month at that club was one by C. B. Brown, advertising director, RCA., *Let's Trade.*

Dr. Leland Brown, Stanford University, discussed *Postwar Lighting* before the San Francisco Executives Club, March 30. The Northern California Section IES was invited to attend.

B.C. League Officers

T. H. Crosby, district manager of the Canadian Westinghouse Co. Ltd., has been elected president of the Electrical Service League of British Columbia, succeeding the late E. E. Walker. Crosby has been a member of the league council for a number of years.

Re-elected as honorary treasurer and honorary secretary respectively were T. C. Clarke, district manager of the Northern Electric Co., and James Lightbody, publicity manager of the British Columbia Electric Railway Co.

W. C. Mainwaring, manager of the merchandising division of B. C. Electric, has been added to the league council. Representatives of the council who will continue in office for another year are: W. D. Robertson, district manager of the Canadian General Electric Co.; H. Gaugh and R. Beaumont. R. Hall has been reappointed executive secretary.

J. R. Dooley has joined the field staff of the league at Vancouver. He had been engaged in war service for two years and prior to that was with the electrical department of the Hudson's Bay Co.

Activities of the league may be extended to cover the entire province, according to a statement made at the recent Western meeting of the Canadian Electrical Assn. in Vancouver. Referring to the league, representatives of the industry, stated that it had made a fine contribution to the development of the industry in Vancouver and that it was hoped to expand its activities to cover other sections of British Columbia and eventually to embrace the entire province.

Colorado Engineers

Ralph B. Hubbard was elected president of the Colorado Society of Engineers at the annual meeting in Denver, Feb. 1, 2 and 3. He is industrial development director for Public Service Co. of Colorado. Named to serve with him were: Dana E. Kepner, vice-president; C. M. Lightburn, secretary-treasurer, and Miss Katharine Wagner, executive secretary.

Arthur F. Hewitt, retiring president, who is provisional state highway commissioner, heads the directorate, which is composed of: R. W. Lindsay, C. A. Davis, C. E. Dobbin, John McGowan, Samuel Judd, Paul K. Seyler, and A. Zulian.

Electric Club of San Diego heard the inside story of the Mexican water treaty from Fred Simpson, member of the Colorado Water Authority of San Diego, at its March 27 meeting.

NEWS of the industry

OREGON LEGISLATURE CURBS PUD ACTIVITIES

PUD acquisitive power was limited in Oregon, where the state legislature passed the Chessman Bill preventing districts from serving outside their own territory without consent of voters in the areas affected. The bill, which at one time faced emasculating amendments in the house, was passed with minor friendly amendments by a senate vote of 29 to 1 and a house vote of 38 to 19, and was signed by the governor.

Containing an emergency clause to prevent its being delayed by referendum election, the act hampers the invasion of municipalities by PUDs. It empowers cities within proposed PUD boundaries to determine by ballot if they are to be engulfed by the district's boundaries, regardless of the majority vote in the rest of the proposed district. The "home rule" provision, which was attacked in the house, is the basis for a legality test of the law which Grange Master Morton Tompkins has announced will be introduced in the Oregon Supreme Court. Tompkins headed the lobby against the measure and Dorothy McCullough Lee, Portland city commissioner, was among those fighting for passage.

According to the provisions of the law, a PUD may extend its services to a "fringe" immediately adjacent to its boundaries but the amount of territory to be served must be determined by the state hydroelectric commission after a public hearing. Incorporated cities, however, cannot be included in this fringe area without the consent of the voters.

The Chessman bill was introduced to prevent another such proposal as that made in Hood River in 1943, and which would have permitted a small rural district to control electric systems throughout the northern part of the state.

PUD Denied Franchise for Competing Power Lines

Application of the Wasco County (Ore.) PUD for a 25-year franchise permitting it to distribute Bonneville Power in The Dalles, was rejected in March by the city council. If the franchise had been awarded, the PUD would have built facilities competing with those of Pacific Power & Light Co., which serves the area. (EWEST, March, p. 92).

Declaring that competing lines would be uneconomical, Mayor George Stadelman repeated an earlier suggestion, that the PUD make a purchase offer to the power company and, if that failed, bring condemnation proceedings. Council members also expressed opposition to competing electric systems and the vote rejecting the franchise request was unanimous. Similar PUD franchise requests have been denied by The Dalles City Council twice before.

New Provisions Change PUD Law in Washington

Three bills granting increased powers to PUDs were passed by the Washington State Legislature during the final days of the session. A fourth bill splitting the State Department of Public Service into departments of transportation and public utilities also was sent to the governor by the legislators.

House Bill 405, one of the measures passed, requires a power company whose distribution facilities have been taken over by a PUD to furnish electrical energy at wholesale to that district, provided the power company has transmission facilities within a reasonable distance. However, there is some doubt as to the ultimate constitutionality of this provision. It is generally agreed that court action will be necessary to interpret it.

Division of the Department of Public Service into two sections will force some companies to operate through two state authorities. Directors of the two departments will be appointed by the governor.

● A SURVEY of transformer capacity at larger Army stations has been ordered by the War Department to disclose and dispose of any excess transformers. Army Service Commands were ordered to complete transformer load surveys at Class 1, 2 and 3 stations promptly, and to remove as excess those transformers not needed. Excess transformers may be sold by division engineers. The War Department directed that coordinators of the Utilities Wartime Aid Program be consulted, where they can be helpful.

● Readjustment of Pacific Gas and Electric Co. rates in Richmond and El Cerrito, Calif., will bring savings of approximately $100,000 annually to residential and commercial lighting customers in those towns.

UTAH POWER SUBMITS REORGANIZATION PLAN

A reorganization plan which would vest ownership of Utah Power & Light Co. with more than 12,000 present preferred stockholders has been filed with the Securities and Exchange Commission by the company and Electric Power & Light Corp., holder of 92% of the voting power.

Under the proposed set-up, Utah Power would cease to be a subsidiary of Electric Power and of Electric Bond & Share Co. The Utah company would pay $650,000 cash for cancellation of 2,100 shares of $7 preferred stock and 3,000,000 shares of common stock held by Electric Power & Light. Other preferred stockholders would then receive all of a contemplated issue of $20 par value common stock on a basis of 4⅞ shares of common for each share of $7 preferred and 4⅜ shares of common for each share of $6 preferred.

The new issue of common stock would amount to 1,185,241 shares with total par value of nearly $24,000,000 and would leave the company with a simplified capital structure of only common stock and debts, consisting (on Dec. 31, 1944) of $42,000,000 first-mortgage 3¾% bonds due 1968, $5,000,000 debenture 6% bonds due 2022, and miscellaneous long-term debts.

Scrip would be issued for fractional shares of the new common which could be combined into lots aggregating one or more shares and exchanged within a year for stock.

PGE Calls in Mortgage Bonds for Redemption

Portland General Electric Co. has called for redemption all the remaining bonds outstanding in its first mortgage, 5% issue of July 1, 1905. Call price is 100½. Redemption date is April 5, and accrued interest will be paid to and including April 4. Bankers' Trust Co., New York, will handle the redemption.

There are outstanding from the original $10,000,000 issue, $3,171,000 of these bonds. The original issue was due July 1, 1935, and was extended to July 1, 1950 by agreement of the bondholders at that time.

This redemption is a straight debt reduction, since it is not contemplated that they will be replaced with any other issue, according to J. H. Polhemus, president.

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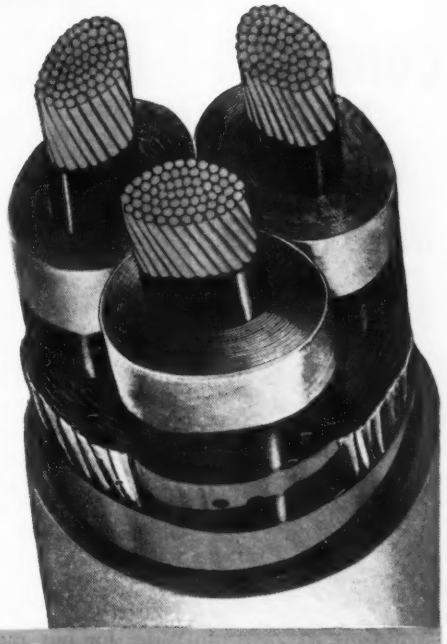

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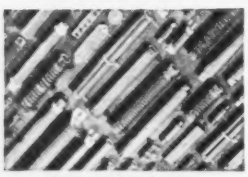
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NORTHWEST SPOKESMEN OPPOSE CVA BILL

Opposition to the creation of a Columbia Valley Authority and in particular to the CVA bill now before congress was voiced by representatives of five Northwest states at a meeting last month in Spokane, Wash. Attending were 50 delegates from state reclamation associations and business groups in Oregon, Washington, Montana, Idaho and Wyoming.

Declaring that they were "weary and wary of increased governmental power", delegates adopted resolutions opposing passage of U. S. Senate Bill 460, offered by Senator Mitchell (D. Wash.) and the Rankin bill providing for creation of nine conservation authorities, including the proposed CVA. At the same time, they went on record as favoring development of land and water resources by the Army Corps of Engineers, the Bureau of Reclamation and the Department of Agriculture, along with the duly authorized agencies of states concerned.

Incorporated into the resolution was the objection that the proposed legislation would not adequately safeguard the rights of states affected. Also brought out was the objection that the creation of an Authority would serve to "usurp administrative functions of and replace federal and state agencies that are already doing a good job in the development of Columbia River resources."

It was suggested by the group that the subcommittee of the CVA bill hold a Congressional hearing within the Columbia Basin at such time that it is able to do so.

The meeting was presided over by Judge Robert W. Sawyer of Bend, first vice-president of the National Reclamation Assn., and was attended by Col. Conrad P. Hardy, Seattle District Army Engineers, chamber of commerce delegates, reclamation groups, and railroad representatives.

PUD Commission Comments On Contract Cancellation

Following cancellation by Bonneville of a power contract with Yakima PUD (EWEST, March, p. 92), the district's board of commissioners declared that it had no intention of proceeding at present with an operating plan. The present commission was elected on an economy program, it was pointed out, and the men who signed the contract in 1941 had been rejected by the voters when they stood for re-election. The board was further quoted as stating that, in the event it felt a need for a contract, it could secure a new one.

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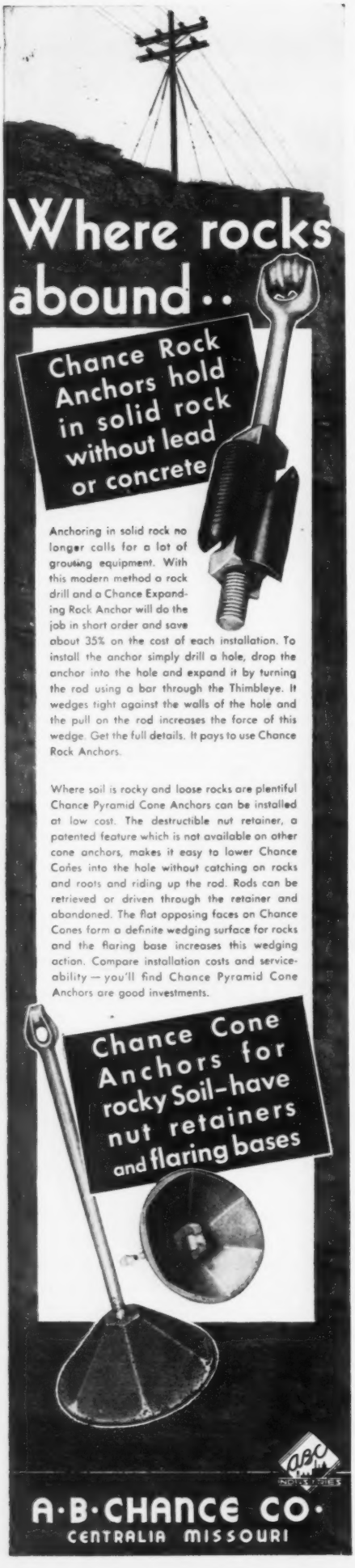
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COLORADO CO-OPS SEEK REDUCTION IN TAXES

REA cooperatives in Colorado are sponsoring a bill in the state assembly which would, if passed, greatly reduce the taxes now paid by the government-financed electric generating and distributing units.

Twin bills, not yet introduced at press time, have been drawn for house and senate. Crux of the measure is a proposal that the Colorado Tax Commission shall value and assess each REA unit for taxation purposes "at an amount which bears the same relation to one-half of the total gross receipts as the total mileage of its transmission and distribution lines within this state bears to the total mileage of such lines wherever situated."

Observers in and out of the legislature note that the REA affiliates now enjoy a tax advantage about 50% lower than that imposed on electric companies, and that the further reduction, if validated by the assembly, would impose a tax burden on taxpayers who would derive no benefit from the cooperatives. Business managed electric companies and municipals are understood to be solidly opposing the proposed bills.

Colorado's REA state executive committee, urging members to get in touch with their legislators and senators, points out that the electric cooperatives now serve some 21,500 farms and that house bill 697 (or senate bill 466) provides the only means to avoid a 36% tax increase which the state tax commission contemplates levying against the cooperatives.

City Has New Plans for Hetch Hetchy Power

Continuing its efforts to find a way out on Hetchy Hetchy power distribution, the City of San Francisco last month signed two new agreements and had two other contracts in preparation, all to be submitted for approval under terms of the Raker Act.

A contract with Pacific Gas and Electric Co. provides that the power company shall transmit all electric energy needed for municipal requirements and includes a clause giving the city the right to condemn the company's distribution system and to expand Hetch Hetchy generating facilities at any time during the life of the contract, which is nine years.

A second nine-year contract, with the Modesto and Turlock irrigation districts, obligates the districts to construct all facilities necessary to transmit and transform power for their purposes.

Contracts with two Kaiser companies, Permanente Metals Corp. and Permanente Cement Corp., were being prepared, it was reported.

To be valid, the agreements must be approved by the Interior Department and by Federal Judge Michael J. Roche. July 2 is the latest date set for enforcement of an injunction prohibiting the city from selling power to PG and E.

Montana Power to Make Accounting Adjustments

Montana Power Co. has been ordered by FPC to make accounting adjustments totaling $51,978,025. The order requires the company to file entries by Jan. 31, 1946, disposing of "write-ups" and other improper charges to plant accounts in the amount of $46,891,597, an amount which the FPC has declared to be 80% of the original cost of electric properties of the company as of Jan. 1, 1937. The amount is the largest so far ordered disposed of by the commission in an accounting case.

High Court Upholds SEC in Holding Company Decision

An SEC order terming the Pacific Gas and Electric Co. a subsidiary of North American Co. was upheld last month by the Supreme Court, which split its vote four to four.

The case was appealed to the high court by PG and E, following a lower court decision upholding the order. Mr. Justice Douglas disqualified himself and took no part in the vote. Under Supreme Court rules, a tie vote affirms the judgment on appeal.

Counsel for PG and E had argued that even though North American, at the time SEC's order was issued, held company stock in excess of the 10% minimum allowed by the Holding Company Act, the power company was not in fact dominated by North American in its operations and policies and should not be held to be a subsidiary. It was argued further that by next January, North American's holdings of PG and E stock will have been reduced below the 10% minimum.

● Western Colorado Power Co. has been granted an exemption to the brownout regulations as a result of showing the war production board that only a negligible amount of coal is used in the production of power at its plant near Paonia. This is the only utility in the Rocky Mountain region to ask or receive such dispensation.

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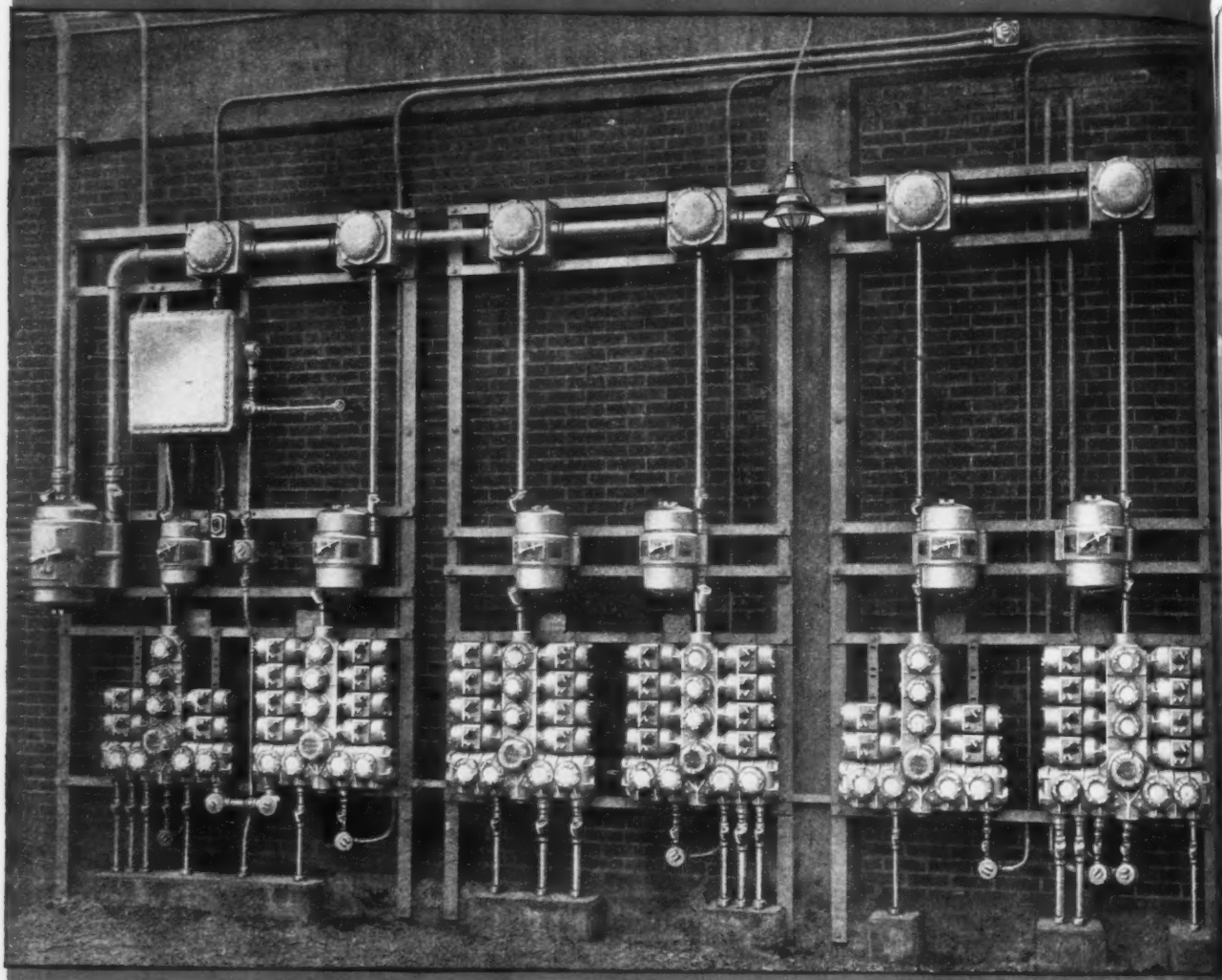

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WAGE ISSUES ARGUED BY UTILITY EMPLOYEES

While a wage dispute threatening to culminate in a strike of nearly 4,000 AFL Pacific Gas and Electric Co. employees was hanging fire with the Tenth Regional War Labor Board in San Francisco late last month, the Utility Workers Organizing Committee (CIO) accepted a board ruling denying a 17 cent an hour wage increase to 9,783 other PG and E employees.

Although the CIO case was certified to the board as a dispute, the company and eight locals of the UWOC in the San Francisco, San Jose, North Bay and East Bay divisions were in agreement that employees received the maximum wage allowable under the Little Steel Formula. The union's demand, based on increased living costs, may be renewed if there is a revision in wartime wage policies, it was ruled.

Meanwhile, officials of the International Brotherhood of Electrical Workers (AFL), collective bargaining agent for all other physical employees of the utility throughout northern and central California, announced an official strike vote would be taken April 9. Early in March individual employees of 3,450 covered by IBEW, without blessings of union leaders, had conducted strike votes and had threatened work stoppage at the end of 30 days because of asserted delays in settling a wage issue.

The wage issue, on which hearings were completed in mid-March with decision pending, involves increases of 18½% (which also would exceed the Little Steel Formula) and demands for elimination of intra-plant and inter-plant wage inequalities. Company officials and labor representatives had failed to reach an agreement in the controversy.

Los Angeles Hires Expert To Make Job Wage Survey

In an effort to settle a wage dispute in the Los Angeles Department of Water & Power, the city council in mid-March approved a contract between the department and a Chicago wage expert for a job survey covering some 5,300 employees.

For a minimum fee of $20,000, J. L. Jacobs and staff will examine the wage structure of the department, reporting to the Board of Water & Power Commissioners what each job is worth on the basis of what is being paid for comparable work in private industry elsewhere. The commission then will attempt to overhaul department salaries, setting up a scientific wage scale, it was reported. Temporary increases of $100,000 a month were voted.

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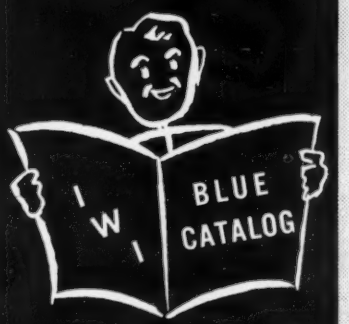

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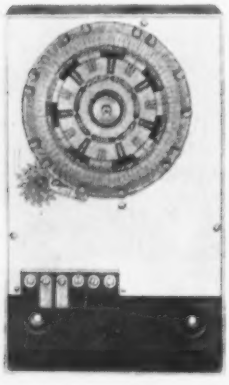

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SHASTA INTERIM RATES GET ICKES APPROVAL

Interim wholesale rates for electricity from Shasta power plant of California's Central Valley development, amounting to about five mills per kilowatt-hour on a 50% load factor, have been approved by Secretary of the Interior Harold L. Ickes, it was announced recently. Rates are scheduled with the provision that they are subject to modification postwar.

Though the bulk of Shasta's water (150,000 kw.) now is sold to the Pacific Gas & Electric Co. under a special wartime contract, 50,000 kw. may be withdrawn and sold to other customers, it is stipulated in the contract. Several municipalities in the Sacramento Valley are interested in purchasing Shasta power, the Bureau of Reclamation reports.

Rates announced, applying to firm power only, vary from 14.27 mills for a 10% monthly load factor to 3.56 mills for a 100% monthly load factor.

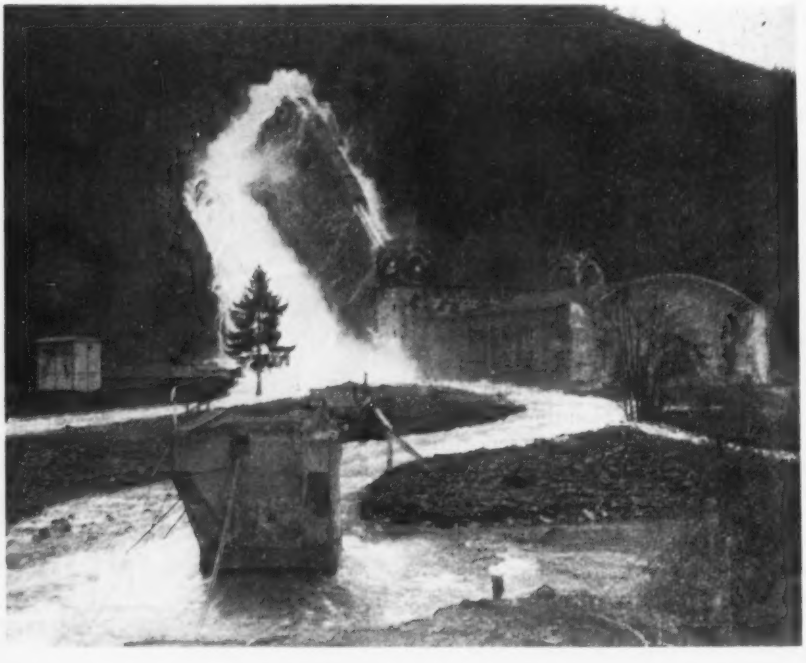
● A MOVE to supply remote sections of Grant County in eastern Oregon with electrical energy was initiated recently by ranchers in the area who organized a cooperative board and met with Rural Electrification Administration officials to discuss power possibilities. M. E. Knickerbocker is chairman of the group. Although some sections of the county are served by West Coast Power Co., long distances between ranches have hindered electric power distribution, it is reported.

Alaska Power Project Authorized by FPC

FPC has authorized issuance of a license to the City of Ketchikan, Alaska, for construction, operation and maintenance of a major electric project on Beaver Falls Creek. The proposed development includes installation of two 2,400-hp. generating units, one of which will be used for standby, and construction of 11 miles of 33,000-volt transmission line to carry power to a substation at the city's existing Ketchikan power plant. Ultimate development contemplates installed capacity of 6,300 hp.

The license was requested because of increased government and civilian demand. The city's present plant has firm capacity of 1,900 hp. and connected capacity of 6,500 hp., it was stated in the application.

During the weeks preceding the breakthrough to the Rhine the Germans used the waters of the Roer River as a natural barrier. Flood gates of the Schawmmaneael Dam were blown causing a minor flood along the stream. Apparently the flood plus demolition activities seriously damaged the hydroelectric plants which were part of the Roer River hydraulic development, as this official Signal Corps picture shows. Both surge chamber and penstock of the plant have been destroyed and the plant itself flooded. Location is near the town of Schmidt.



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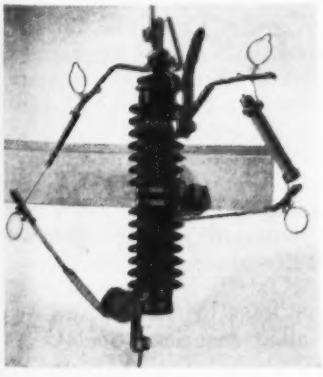

↑ **THE TYPE P**—The Kearney Type P Lightning Arrester has an impulse rating of 41,000 amperes and a follow current interrupting rating of 3000 amperes. A long insulator leakage path assures maximum protection. In the event of an abnormal discharge an economical easily replaced cartridge is the only part subject to damage, which is visible at a glance.

← ***Combination*** **TYPE T TRIP-O-LINK ARRESTER**—This unit combines the Kearney Type T Arrester and the efficient Trip-O-Link Fuse Switch into a single assembly. Eliminates the need of an extra mounting to pole or crossarm and only one line lead is required—results in greater economy and facilitates hot line work on any pole.

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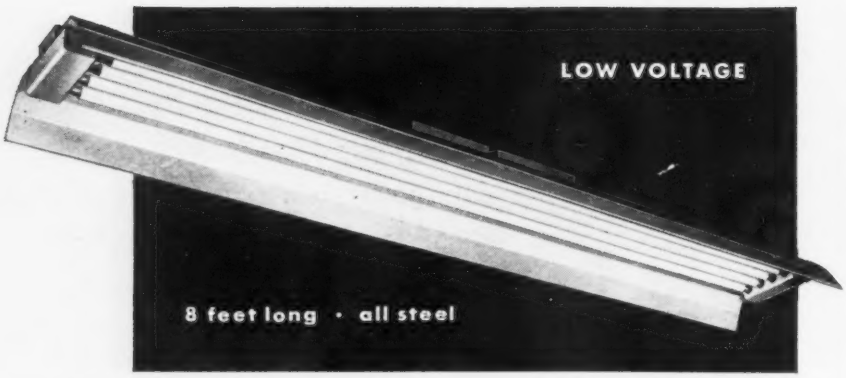

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COLORADO PROJECT ON USBR "MUST" LIST

The Colorado River-Big Thompson water diversion project is, once more, on the U. S. Bureau of Reclamation's "must" list for completion by May 1, 1946, and has the benediction of the War Manpower Commission.

In January the WMC considered the irrigation-power generating enterprise less essential to the war effort than other undertakings and, as a consequence, crews lining the Alva Adams tunnel—connecting link through which western Colorado waters will flow to eastern slope farm lands and into power generating plants — were recruited for work elsewhere. More recently, the War Food Administration declared the Colorado-Big Thompson project essential to food production in the national emergency, and Chief Engineer Walker R. Young of the Reclamation Bureau announced that "the project will be prosecuted with all possible dispatch."

Engineering details that must be completed: Adams tunnel must be lined from end to end with concrete; workmen are now pouring inverts. Shadow Mountain Dam and dike, to divert flow from the north fork of the Colorado River, must be finished. Now barely started, it will be 44 ft. high and 600 ft. long. (The reservoir at this point will be joined by a strait from Grand Lake. Water will then run from Grand Lake into Adams tunnel.) A conduit to carry water from the tunnel to the Big Thompson channel must also be built. No mention of the electric energy development phase was made during the recent discussions, but the great hydro power sources will be available as an incident to irrigation of 615,000 acres in the Northern Colorado Conservancy district next spring.

● WPB APPROVAL has been secured for construction by Bonneville of additional facilities in the Longview area, Warren H. Marple, manager of Bonneville's lower Columbia district, announced last month. Scheduled for completion during the summer, the installation will include a substation with initial capacity of 37,500 kva., to be built near the Cowlitz County PUD substation at Columbia Way, and a four-mile, 115,000-volt wood pole line from Bonneville's Longview substation to the new station.

● PURCHASE by Gallup, New Mex., of the Gallup American Coal Co.'s electric power plant at Gamerco, which formerly sold power to the municipal distribution system, has been negotiated for $125,000, it was announced recently. The plant is rated at 5,000 kw.

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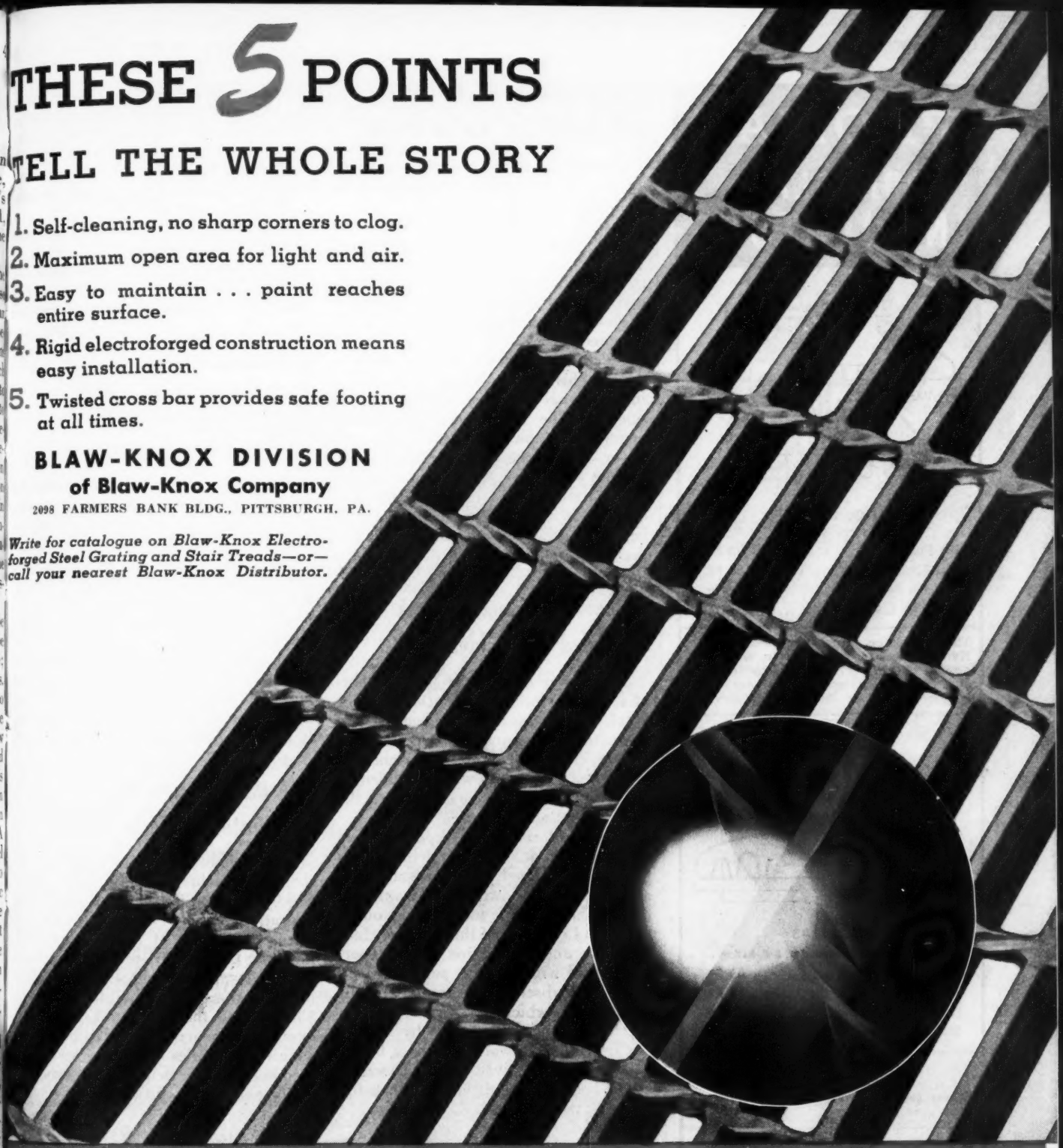

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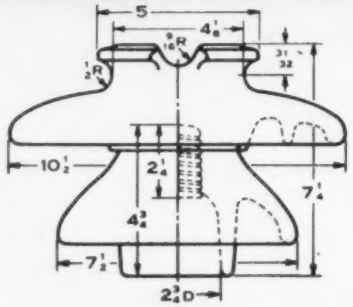

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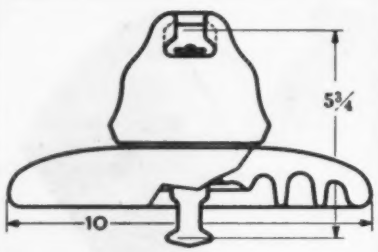

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STATE DEPARTMENT SAYS NO ON PILOT KNOB PLANT

Application by California's Imperial Irrigation District for permission to build a 33,000-kw. power plant at Pilot Knob on the All-American Canal was turned down by the Department of State, according to word received by the district from Edward Falck, WPB war utilities director. The $5,500,000 project was planned as a postwar development.

Falck said the application had been denied "for reasons growing out of the international relations of the United States." The Department of State is negotiating the proposed Colorado River water treaty with Mexico, and district officials expressed belief that, if the treaty is ratified, control of the flow of water in the All-American canal will be relinquished, along with control of the Colorado.

Channel Improvement Work Scheduled for Boulder Dam

To recover about four feet of operating head for Boulder Dam power plant, now unavailable because of downstream channel obstructions, a $2,586,450 tunnel and river-channel improvement project was scheduled to begin late in March, according to the Bureau of Reclamation.

Work will consist of dredging bars and an accumulation of debris from the river channel for a distance of about 3,000 ft. downstream from portals of the spillway tunnels and outlet tunnels. Lowering of the water surface elevation and restoration of the operating head will be made permanent by eliminating discharge characteristics of four tunnels which have contributed to the formation of bars, and by removing from canyon walls and river banks in reach of the river materials which might become dislodged and block the channel, it was reported.

Agreement Releases Nisqually Contractor

An agreement has been signed between the City of Tacoma and the L. E. Dixon Co., contractor for the La-Grande Dam and the Alder Dam power house, whereby the construction firm is to consider its work completed, it was reported last month.

Under terms of the agreement, the L. E. Dixon Co., is to return to the city light department $55,451 in contract money, plus $13,129 for finishing work. In consideration for the reimbursement, the company will be relieved of the necessity of remaining on the job until two 25,000-kw. generators arrive for the Alder power house. Delivery of one is expected in time for installation this summer, but the government has not indicated when the second will be approved.

The Dixon contract covered approximately $7,000,000 of the total cost of the project. First electricity from the enlarged LaGrande power plant has been delayed pending completion of the mile-long tunnel from the La-Grande diversion dam to the power house.

Rural Electrification on B. C. Postwar Program

Plans to provide electric power to 80% of the British Columbia population not now served were contained in a postwar rural electrification program announced recently by W. G. Murrin, president of the B. C. Electric Railway Co. of Vancouver.

Murrin stated that plans have been completed for the construction of new rural power lines which will serve between 6,000 and 7,000 individual homes. The power lines will be erected during the five-year period immediately following the end of the war.

REA Makes Allotments For Western Projects

Recent loan allotments approved by the REA include three in the West: $55,000 to the Farmers' Electric Cooperative, Clovis, N. M., to build and acquire 59 miles of line to serve 151 members; $70,000 to the Garkane Power Assn., Richfield, Utah, for service extensions and rebuilding of line; $360,000 to the Socorro Electric Cooperative, Socorro, N. M., to build and acquire 240 miles of line to serve 974 members, and to acquire and rehabilitate generating facilities.

● PERMISSION to serve Lincoln County in western Wyoming with electricity was granted Utah Power & Light Co. by the Wyoming Public Service Commission recently. The Utah utility will construct, maintain and operate an electric transmission and distribution system in the portion of the area not now served by California-Pacific Utilities Co., it was reported.

● UTAH POWER & LIGHT CO. plans to increase substation facilities by construction of a new 5,000-kw. station in the vicinity of Sixth South and Main, company officials stated recently. The unit will be served from a proposed 44,000-volt line, it was reported.

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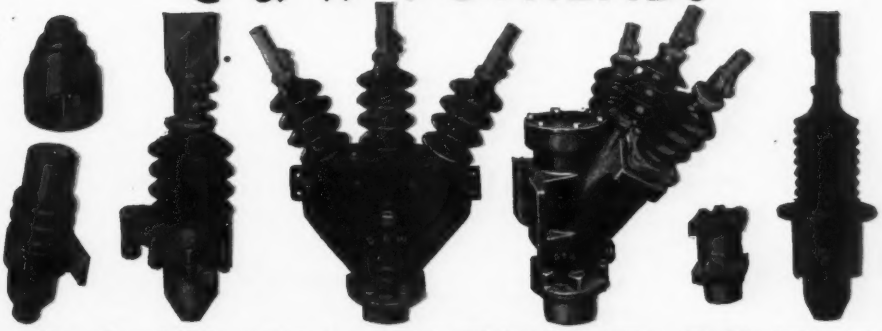

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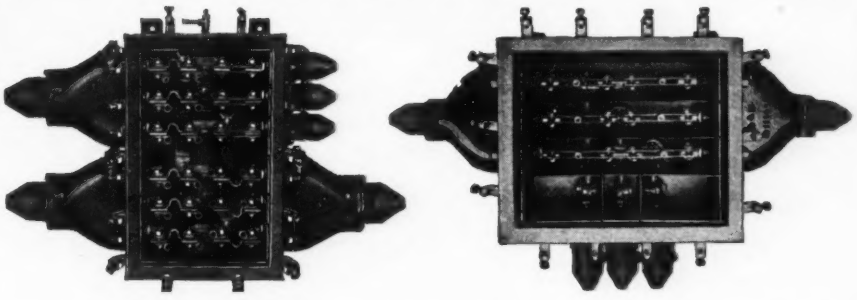

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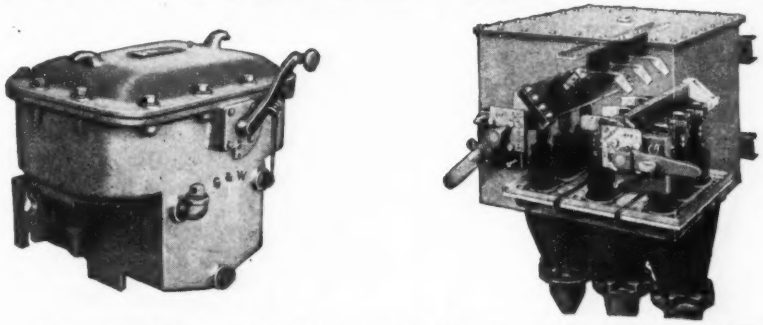

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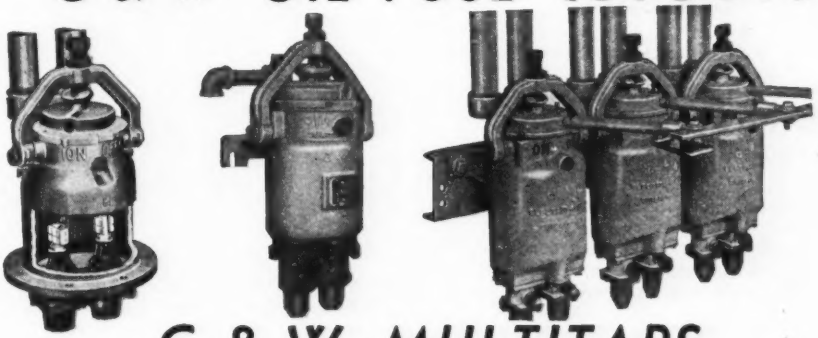

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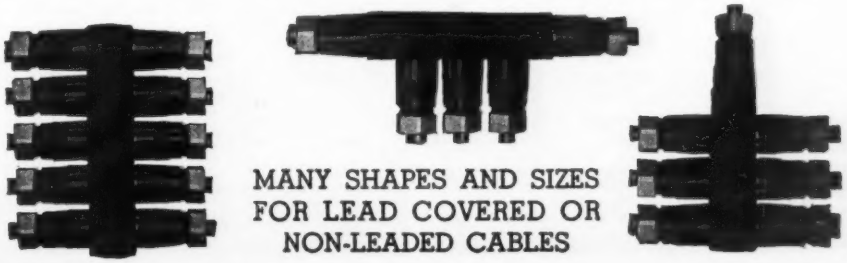
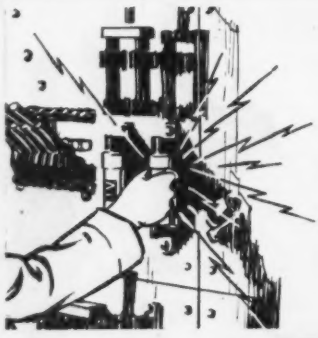


MANY SHAPES AND SIZES FOR LEAD COVERED OR NON-LEADED CABLES



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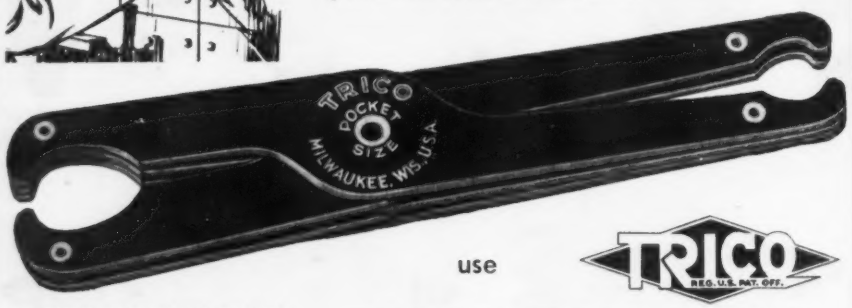

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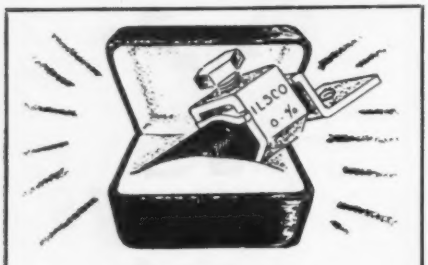

On Performance

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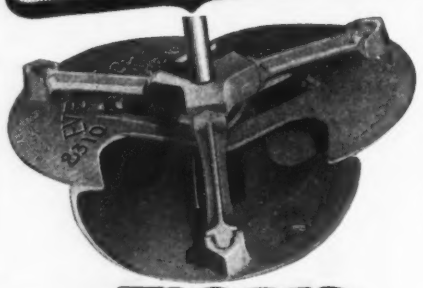

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POWER COMPANY APPEALS IN CONDEMNATION CASE

Appeal from the condemnation judgment awarded the Sacramento (Calif.) Utility District in January was filed in district court late last month by the Pacific Gas and Electric Co. The appeal follows denial of power company motions for a new trial.

The judgment gives the district the right to acquire PG and E distribution facilities in the Sacramento area for $11,632,000. Both the district and the company requested revaluation hearings, now pending before the California Railroad Commission. PG and E contends that the valuation, made in 1938, is too low because of property additions; the district claims that value has been lowered by depreciation.

California Companies Win Security Award

In recognition of a superior brand of wartime production of the Boulder Canyon development, the Office of Civilian Defense of the State of Nevada granted the National Security Award to the two power operating agencies at Boulder Dam, the Southern California Edison Co. and the Department of Water and Power of the City of Los Angeles.

Col. J. W. Leedom, senior field representative of the protection services division of the Ninth Region of the Office of Civilian Defense, presented the award at public ceremonies in Boulder City. It was accepted by Samuel B. Morris, chief engineer and general manager of the Department of Water and Power, and H. W. Tice, Edison vice-president in charge of operation.

The National Security Award is a certificate of merit given to industrial plants and related facilities for outstanding accomplishments in total war protection and security. Recognized are measures to afford adequate protection against air attack, sabotage and avoidable accidents, as well as maintenance of around the clock operation of power plants and manufacturing plants making weapons of war.

● GEOLOGIC conditions at 24 potential dam sites in Utah, Wyoming, Colorado, Arizona and New Mexico are discussed in a report prepared by Arthur M. Piper of the Geological Survey. Field examination of the rocks exposed in fairly extensive neutral outcrops and in road cuts has made possible an evaluation of the bearing power and water tightness of the rocks at the sites, it was stated.

1/45
Sample from San Bernardino -
Bishop Line of
California Electric Power Co.
Erected in 1912 - Removed 1-28-44
from Span No. 1008 - 1009

"Good as New"

AFTER 30 YEARS SERVICE

A low flying bomber in California took down a span of A.C.S.R. line, which had been in continuous service for thirty years. Laboratory examination of this thirty year old cable resulted in the report "Good as new".

Dependability is an outstanding characteristic of Aluminum Cable Steel Reinforced. More than a million miles sold by Alcoa for rural and hi-lines are evidence of this fact.

Planning to build new lines or extend old ones? Alcoa's engineers will help you select A.C.S.R. having desired characteristics.

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"You have ALL Types of Tees to choose from—

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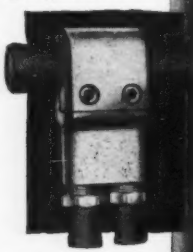
All in one catalog, for your handy selection — *every* good type of tee connector... Each one carefully designed and tested, and manufactured under rigid engineering supervision.

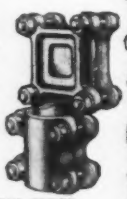
Penn-Union Type HFM, with one-bolt or 2-bolt hinged clamp for the main. One or more branches can be connected afterward. Multi-slit tapered sleeve assures permanent grip on branch.



Penn-Union Hinged E-Z Tee takes a wide range of branch sizes. One-piece design makes installation easy. Tap connections can be made at any time.

Clamp Type Tees for all sizes of tubing and cable—a complete line. Machined contact surfaces.

Types for All Combinations —for connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes.



Penn-Union E-Z Tee is ideal for accommodating a large range of conductor sizes on both the main and branch. Will not loosen. 2, 3 or 4-post.

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Conductor Fittings

RADIO PROGRAM IS FOR G. I. JOE — CIVILIAN

To help the returning serviceman become adjusted to civilian life and enable him to obtain all the benefits possible from the G. I. "Bill of Rights," as well as other military legislation, the San Diego Gas and Electric Co., has inaugurated a half-hour weekly radio show entitled, *G. I. Joe—Civilian.*

Believed to be the first of its kind in the nation, the show is scheduled for a 26-week run. Featured on each broadcast are questions by service men about military legislation and how these bills affect them in each of their individual cases. The questions cover such important subjects as how to start one's own business with aid from the government under provisions of the bill, how to build a home, or how to continue one's education.

The questions are directed at a group of three experts chosen from the ranks of leading San Diego business and professional men most familiar with the business, professional and educational aspects of the bills. Three different service men and three different civic leaders are featured on each show.

The program is offered in the interests of public service and is part of the utility's own policy of maintaining an active interest in the welfare of its employees now serving in the armed forces. Credit for the idea goes both to F. M. Raymond, advertising superintendent, and Hance H. Cleland, company president, who, as PCEA president, was responsible for the publication and distribution of the booklet, *You and Joe and His Job,* to 5,000 of America's leading industries.

Moderator of the program is Bob Fling, producer of many national network broadcasts.

● A BOBCAT prowling in the desert between Orchard and Mountain Home, Idaho, momentarily blacked out the City of Boise, when it climbed an Idaho Power Co. pole and short circuited a 69,000-volt transmission line carrying power into the city. Although electric service interruptions ranged from a few seconds to three minutes, location of the break and the repair job required most of the night. A crew sent out from Mountain Home mired down in the mud, but Boise linemen, traveling in a four-wheel-drive vehicle purchased from the Army, had no difficulty in reaching the scene.

● PORT OF PORTLAND is installing two oil-filled cables 15 ft. below the bed of the Willamette River for Portland General Electric Co., which has had several like cables damaged by vessels, it was announced recently.

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FULL AUTOMATIC EQUIPMENT

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AMERICA WANTS PROSPERITY

A BOOK to be published early in April by the McGraw-Hill Book Company carries the provocative title "Prosperity: We Can Have It If We Want It." Its authors, Messrs. Shields and Woodward, state in vigorously challenging terms their conviction that the United States will emerge from war with human, material and technological resources adequate to provide a nation-wide standard of living unprecedented in world history. They present, too, their formulation of the several policies and procedures which must be followed by government, business, and labor if we are to realize our potential for a high and sustained prosperity unmarred by prolonged periods of severe unemployment and business stagnation such as have haunted our economic past.

The specific proposals set forth will elicit both enthusiastic acclaim and acrid dissent, for the book deals in far from gentle fashion with many of the currently fashionable panaceas for assuring prosperity by magic formula. It examines, and discards as effective guarantors of prosperity, whatever their individual merits upon other grounds, programs for public works, slum clearance, subsidizing of small business, foreign loans, social insurance, deficit government spending, redistribution of income, the numerous formulae for monetary management, repeal of the anti-trust laws, or any of the loosely-phrased admonitions that government should do nothing and allow everything to take its course untrammeled by controls of any kind.

On the positive side, the book urges clear recognition of the fact that prosperity, under a system of business enterprise, depends primarily upon the existence of competitive incentives that spur capital investment to provide better tools and equipment, that improve organization and technology to insure continuously increasing productivity per man-hour of work, and that enlarge markets by producing what the consumer wants at lower prices to the end that real incomes may be increased.

In short, prosperity depends upon profitable and expanding business and employment opportunity, so it becomes the part of enlightened government, business, agriculture and labor policy to promote those measures which will forward rather than retard the major aim of expanding production.

However great the room for dissent upon the adequacy, or the phrasing, of the specific recommendations it makes, the approach of this book has one virtue of solid merit. It attacks positively the problem of what steps should be taken to achieve and hold prosperity rather than merely devising a poultice to be applied when and if we run into a decline.

Virtually all responsible spokesmen for government, and for business, labor, and agricultural groups, are agreed upon the goal of prosperity. Moreover, they agree that, insofar as possible, it should be achieved through the effort of private enterprise, with government intervention utilized only as a last resort. But despite this unanimity, almost all public discussion of the problem has concentrated upon the nature, the extent, and the timing of such government expenditures as may be found necessary to combat deflation. Since upon this question there is far from general agreement, our procedure has created an exaggerated sense of divergence in a field in which, so far as fundamentals go, we all are in accord to quite an unusual degree.

☆ ☆ ☆

No confusion should be caused by the fact that the generally current phrase for prosperity is "full employment." The latter phrase merely states the goal in terms of human values, which are good terms in which to state any goal. What matters is that we generally are agreed as to what we mean when we say that we want prosperity or full employment. Not only do we know what we mean, but within very rough limits we can give dimension to our concepts. There are a few whose appraisals are somewhat lower, but most competent estimators set the goals for about 1950 at an average annual employment in civilian jobs of between 55 and 57 million persons, with a gross national product of between $185 and $200 billion measured at 1943 price levels. This contrasts with the 1944 level of non-military employed of 51½ million, and a gross output for the end of 1944 of over $200 billion. It assumes a reduction of the average workweek to 40 hours.

It will take some such levels as these to provide employment for those who seek work, with only sufficient "frictional" unemployment (those temporarily listed as unemployed because of the normal turnover between jobs) to afford reasonable labor-market flexibility to both workers and employers. The non-military employment figures are generally consistent with the officially stated postwar goal of jobs for 60 million workers, since the latter figure is generally understood to be an estimate of the *labor force,* which includes members of the armed services and an allowance for frictional unemployment.

There are a number of reasons why the estimates cannot be figured more closely, and why no one can be very confident even of the validity of the stated limits. The chief points of doubt in the employment estimates relate to how many withdrawals there are likely to be on the part of women, oldsters, and youngsters, who now are in the labor force to a number more than 6 millions beyond normal expectancy; how many men will be retained in the armed forces; and whether the

postwar frictional unemployment should be calculated as approximating the current 1 million or the 3 million so-listed in the prosperous year of 1929. Additional uncertainties cloud the estimates of gross national product. Notable among them is the fact that no one is sure of the war's effect upon man-hour productivity trends, in view of the fact that half of our current output has consisted of products that had no substantial counterpart in our peacetime price or production series.

☆ ☆ ☆

Nevertheless, despite such qualifications, it is fair to say that we do have a general conception of the magnitude of our postwar goals. Although they are well within our production potentials as demonstrated in this war, they are formidably beyond any previous record of peacetime achievement. Only the most sanguine optimism could lead one to expect that they will be achieved without concerted will, planning, and cooperative effort. Only blind recklessness could engender confidence that once attained they will automatically be held, let alone expanded in normally healthful growth.

If we were to follow past patterns, our war-built boom would, after a period of uncertain length, collapse into disastrous depression. The very magnitude of our recent growth would contribute to the depth and duration of the subsequent trough. Yet a fall even to the level of our previous peacetime-peak-year 1939, has been estimated by The Federal Reserve Board to imply unemployment for between 15 and 20 million persons. If human values have importance, that is something that must not be allowed to occur. If business values have importance, we must not tolerate again such losses as occurred from 1930 to 1933, when sales over the four year period were $128 billion less than would have been provided if the 1929 level had held, and corporate profits declined from more than $7 billions in 1929 to an average annual loss of $1 billion over the next four years. A repetition of these things cannot be tolerated—*if foresight and cooperative effort can prevent them.*

☆ ☆ ☆

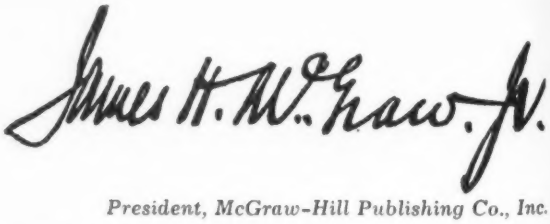
In January of this year Senator Murray introduced in the Senate a bill entitled "The Full Employment Act of 1945." It instructs the President to submit to Congress plans for eliminating both unemployment and inflation, including recommendations for correcting structural defects in the economic system. It provides for a Joint Congressional Committee to consider the proposals of the President, to take testimony from experts and the general public on these proposals or any others it may wish to consider, and after weighing all the facts to submit its findings to Congress. It provides for an advance budgeting of the constituent parts of a full-employment economy, and commits the Federal Government to provide, in advance, for sufficient expenditures (through private contractor channels) to make up for the gap between estimated private expenditures and the amount necessary to assure full employment.

By no stretch of the imagination can The Full Employment Bill, in its present form, be regarded as acceptable to business. Yet it may well present a test of whether or not American business can deal with problems in this area in a statesmanlike fashion. Such statesmanship will consist in demonstrating first, that the Bill is not acceptable because of deficiencies which preclude the possibility of its accomplishing the avowed purposes; and second, that business is able and anxious to offer constructive suggestions for remedying these deficiencies.

It is easy to point to weaknesses in the Bill. To mention only a few of major importance: The proposal to make advance Federal expenditures to compensate for estimated deficiencies in prospective private expenditures is completely impracticable. No one in the country can predict future trends with sufficient accuracy for this purpose; no one can tell what the constituent parts of a really high, *stable* peacetime budget should be, for in our boom-or-bust economy we have no stable pattern to project; no one can tell, within reasonable limits, how much the government should spend *in advance* to assure full employment. The Bill pronounces labor's right to work without defining commensurate responsibilities which it should exercise. It does not define the areas of proposed government expenditure in such a way as to allay business fears of government competition or the general public suspicion of leaf raking. Above all, the Murray Bill is defective in that, despite a somewhat vague pronouncement in favor of forwarding private business activity, it recommends a single specific designed to supplement such activity rather than stimulate it.

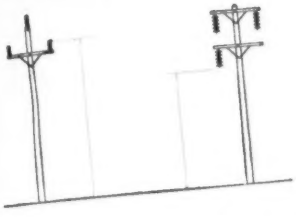
The very definition of certain of these faults suggests their remedies. But the positive task of stating how the Bill should be amended in order that it may have effective usefulness is far from simple. Yet it is enormously to the advantage of American business to undertake it. Fortunately, there is a representative group sponsored by industry, The Committee for Economic Development, which has for some time been working intensively upon the problem, and which is excellently equipped to offer sound and progressive advice. It should be used for this purpose.

American business cannot afford to take a negative attitude toward legislation in this field. Some legislation undoubtedly will pass, for the problem is one in which there is a grave government responsibility. But equally there is a comparably important responsibility upon all citizen groups. None of them has more to gain or lose from the rise or fall of prosperity than American business.



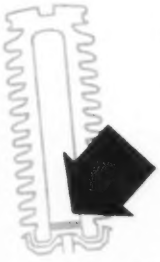
President, McGraw-Hill Publishing Co., Inc.

LINE POST CONSTRUCTION IS ECONOMICAL FOR CONVERSION TO HIGHER VOLTAGES *OR* NEW BUILDING

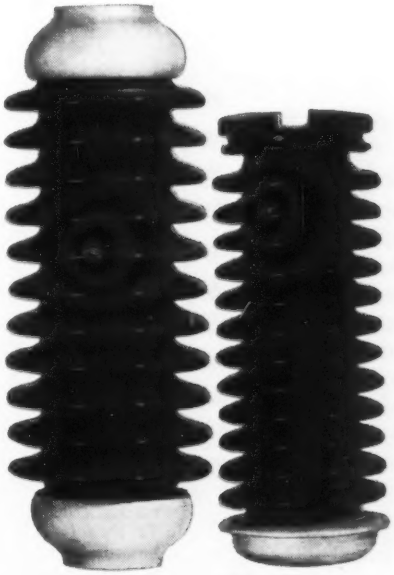


Any still-sound transmission line can be converted to higher voltage at low expense—and economically of manpower—by reinsulation on Line Posts. Ordinarily only new cross-arms and insulators are needed, and the job can be done with hot-line tools or during low-demand hours. For new construction, Line Posts offer substantial advantages in cost and operating performances. Because of the Line Post's upright height, it provides extra ground clearance —or in some cases the opportunity to use poles of the next shorter length.

LAPP LINE POSTS ARE LONG-LIVED... ALL HARDWARE EXTERNALLY ATTACHED



A feature of the Line Post in the original Lapp design was the *external attachment of all hardware,* and the elimination of nested porcelain parts. An inherent characteristic of porcelain is that it is at least ten times as strong in compression as in tension. Much of the failure from cracking in conventional insulators comes from bursting tension forces induced by thermal change. Lapp considers that its original conception was sound, and offers Line Post and Station Post insulators with all hardware externally attached—and still claims "*no cracking*" as a feature of these units.



Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N. Y.

Some Things speak for themselves

THE WAR DEPARTMENT OF
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RECOGNIZES IN THIS AWARD FOR DISTINGUISHED SERVICE
THE LOYALTY ENERGY AND EFFICIENCY IN THE PERFORMANCE
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AIDED MATERIALLY IN OBTAINING VICTORY FOR THE ARMS
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THE IMPERIAL GERMAN GOVERNMENT AND THE IMPERIAL
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The parade of citations and stars awarded to Driver-Harris for contributions to the war effort in the highly specialized field of alloys, began as far back as 1918.

This equivalent of the Army-Navy "E" was awarded to our craftsmen 27 years ago in recognition for their "loyalty, energy and efficiency."

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First exclusive manufacturer of electrical and heat-resistant alloys to receive the Army-Navy "E" Award for the 4th time. There is no greater reward for the steadfast devotion of Driver-Harris employees to their country in time of war.

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KEEP THE BONDS YOU BUY

PEOPLE
made this news

Glasgow Succeeds Ayres In San Diego Power Company

Succeeding K. B. Ayres, whose retirement as superintendent of electric transmission and distribution for San Diego Gas & Electric Co. was announced last month, is A. S. Glasgow, former assistant superintendent of the department. A graduate of Pennsylvania State University, Glasgow was employed by the company in 1916 as the first district manager of the Oceanside territory. At that time there was no connecting line to San Diego, and Oceanside was served by a bathhouse and steam plant capable of generating 125 kw. Prior to his employment by the San Diego Gas & Electric Co., Glasgow was an engineer with the General Electric Co.

With the promotion of Glasgow came the announcement that "Clem" J. Nevitt is the department's new assistant superintendent. A graduate of the University of California, Nevitt first went to work for the utility's engineering department in 1936 as an estimator. In 1941 he was made an engineer in the electric distribution department.

● N. J. LIND, since 1903 erecting engineer for the Pelton Water Wheel Co., San Francisco, was among those rescued from the Japanese prison camp at Los Banos. Lind arrived in the Philippines in the spring of 1941 to superintend installation of three 12,500-hp. turbines for the Caliraya power project. Two of the turbines were delivering power when the Japs arrived. According to word received from Lind, the Japs had planned to kill all in his camp, where, he states, they lived "like cattle on grass and 160 grams of rice a day."

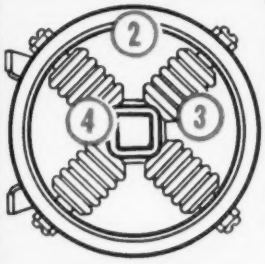
● THOMAS H. KEPNER has been transferred to the Westinghouse Emeryville, Calif., plant as production and procurement supervisor. He had been staff supervisor of the manufacturing and repair department at Pittsburgh.

● HARRY BACHELDER, lighting director of the Puget Sound Power & Light Co. of Seattle, has been transferred to the company's Central division, and named assistant utilization manager.

● WARD R. SCHAFER, former Western manager for Hotpoint, has been elected vice-president in charge of sales for that company. His headquarters are in Chicago.

CHECK the FACTS

1. Sealed, dust proof, individual bus housing provides phase isolation and prevents interphase short circuit. Removable covers in unit sections simplify routine inspection.
2. Supporting ring frames equalize all stresses. Can be mounted in any position.
3. With interchangeable insulator units always in compression, porcelain is used to its best advantage.
4. The same conductor support collar is used for both fixed and expansion slide position. Conductor can be square, round, channel or bar, insulated or bare.



Shown here is an application of an Enclosed Isolated Phase Bus, providing protection from dust contamination deposits, at a prominent steel mill in the East. The bus extends from the generator to a wall cubicle inside—shown below; then outside and across to the transformer in the switchyard, as shown above.

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

R&IE

ISOLATED PHASE BUS

GARLAND-AFFOLTER ENGINEERING CORP.

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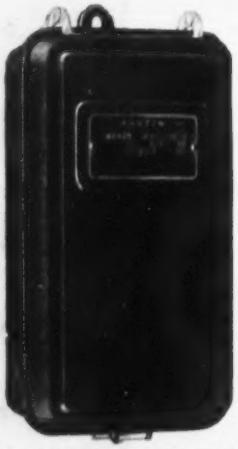
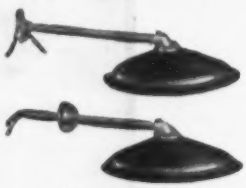
AUSTIN

Everything Electrical for Farm Wiring

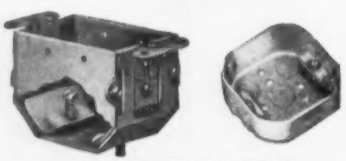


POULTRY HOUSE LIGHTING TIME CONTROLS

ELECTRIC FENCE CONTROLLER



YARD LIGHTS



BOXES AND FITTINGS

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ELECTRIC FENCE CONTROLLERS
YARD LIGHTS AND R.E.A. WIRING
BOXES AND FITTINGS

THE M. B. AUSTIN COMPANY
108-116 So. Desplaines St., Chicago 6, Ill.

PACIFIC COAST REPRESENTATIVES
ERNEST F. HAUCK, Chronicle Building, San Francisco 3 Calif.
H. M. POMEROY, 1004 East 4th St., Los Angeles 13, Calif.
W. W. WHEAT, 560 1st Ave. South, Seattle 4, Wash.

● REUBEN E. LAGERSTROM, illuminating engineer, has been released from his temporary service for the U. S. Navy as radar technician at Pearl Harbor and has been attached to the Pacific sales district of the General Electric Co. Lamp Division, at Oakland. In 1941-42 he was illuminating engineer for that district when he relieved Sam Hazelton, who went into the Army as a reserve officer. Later when Hazelton was released from active duty, Lagerstrom went to the Chicago district. Now both are on the Pacific district staff.

● ARTHUR HALLORAN, one of ELECTRICAL WEST'S first editors when the magazine was known as the *Journal of Electricity, Power and Gas*, has returned to his home in Berkeley after serving on the staff of the radio research laboratory for the U. S. Army at Harvard University. He later edited the magazine *Radio*, and did consulting work in radio and television with Farnsworth and then retired. But he was called back to serve in this radio and radar laboratory, for which he will still devote a portion of each year.

● GEORGE ALLARD, chairman of the Nevada Public Service Commission, has been named to the National Association of Railroad and Utilities Commissioners' committee for cooperation between state and federal commissions, it was announced in mid-March. Allard, whose state was credited with playing a "major role in promoting cooperation between state and federal commissioners", was scheduled to attend sessions of the committee in Washington, D. C., late in March.

● PAUL B. MCKEE, president of Pacific Power & Light Co., has been made a member of the 1945 executive committee of the National Association of Manufacturers. McKee has been active as a member of the NAM board of directors, a position he assumed in 1943. He was president of Emprezas Electricas Brasileiras in Brazil from 1927 to 1933, and has since maintained a close interest in trade relations between the two nations.

● E. F. SCATTERGOOD, for many years chief engineer and general manager of the Los Angeles Bureau of Power & Light, who has recently served as advisory engineer for the city's Department of Water & Power, will be given a flat five-year contract without a cancellation clause, as the result of recent action by the Board of Water & Power Commissioners. The contract is for $1,000 a month.

● J. N. CAROTHERS, former director of research for Monsanto Chemical Co. and the Federal Phosphorous Co., has been named chief of the Bonneville Power Administration's industrial analysis section, it was announced recently. He will work with Pacific Northwest research institutions interested in the development of chemical and metallurgical industries. A native of North Carolina and graduate of the University of Missouri, Carothers has been engaged in private research and consulting work since 1942.

● RALPH J. CORDINER, well known in the West, has been elected vice-president and assistant to the president of General Electric Co. He had been assistant to the president since his resignation as vice-chairman of the War Production Board more than a year ago. Educated in the West, Cordiner began his career on the Pacific Coast, first with Pacific Power & Light Co. and later with Edison General Electric Appliance Co.

● TOM H. RICHARDS was appointed a director of the Sacramento Municipal Utility District recently. He fills the unexpired term of Robert A. Merkley who died Jan. 3. Richards, who is general manager of the Bercut-Richards Packing Co., will serve until Dec. 31, 1948.

● JAMES KELLEY, sales manager for Graybar Electric Co. of Seattle, has retired after 34 years with the company. He is succeeded by John Lawton, formerly branch manager of Graybar at Des Moines, Iowa.

● EUGENE R. NICOLAI, formerly associated with the U. S. Bureau of Mines in Washington, D. C., recently assumed duties of information specialist with the Bureau of Reclamation at Coulee Dam, Wash.

● UNDER a new line-up in OWU's power supply section, S. P. Darlington will handle the Western region, including West Coast and Rocky Mountain states, Arizona, New Mexico, North and South Dakota, and northern Minnesota.

● HOUSTON B. WATSON has been appointed apparatus and supply manager of the Southwestern district of the Westinghouse Electric Supply Co. He succeeds W. G. Sterett, resigned.

● NORMAN R. MILLER has been transferred by Westinghouse from San Francisco to Los Angeles as Marine division application engineer.

● H. L. WILLIAMS is now sales engineer for Arrow-Hart & Hegeman Electric Co., in Seattle, succeeding D. J. Norris, who joined Globe Electric Co.

2ND TEST OF A SERIES

Reliable proves that STRAIGHTLINE SPLICES AND DEAD ENDS ARE VIBRATION PROOF

Engineered and built in our own factory, this elaborate vibrating machine reduces years of actual field service to a matter of hours. Accelerated vibration studies on this machine cannot loosen Reliable Connectors, Splices or Deadends. Practically any vibration frequency and load range can be studied with the aid of a strobescope, proving the merits of design details without risking failures in the field.

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Here is a typical test proving the Reliable Splices and Deadends do not concentrate fatigue strains.

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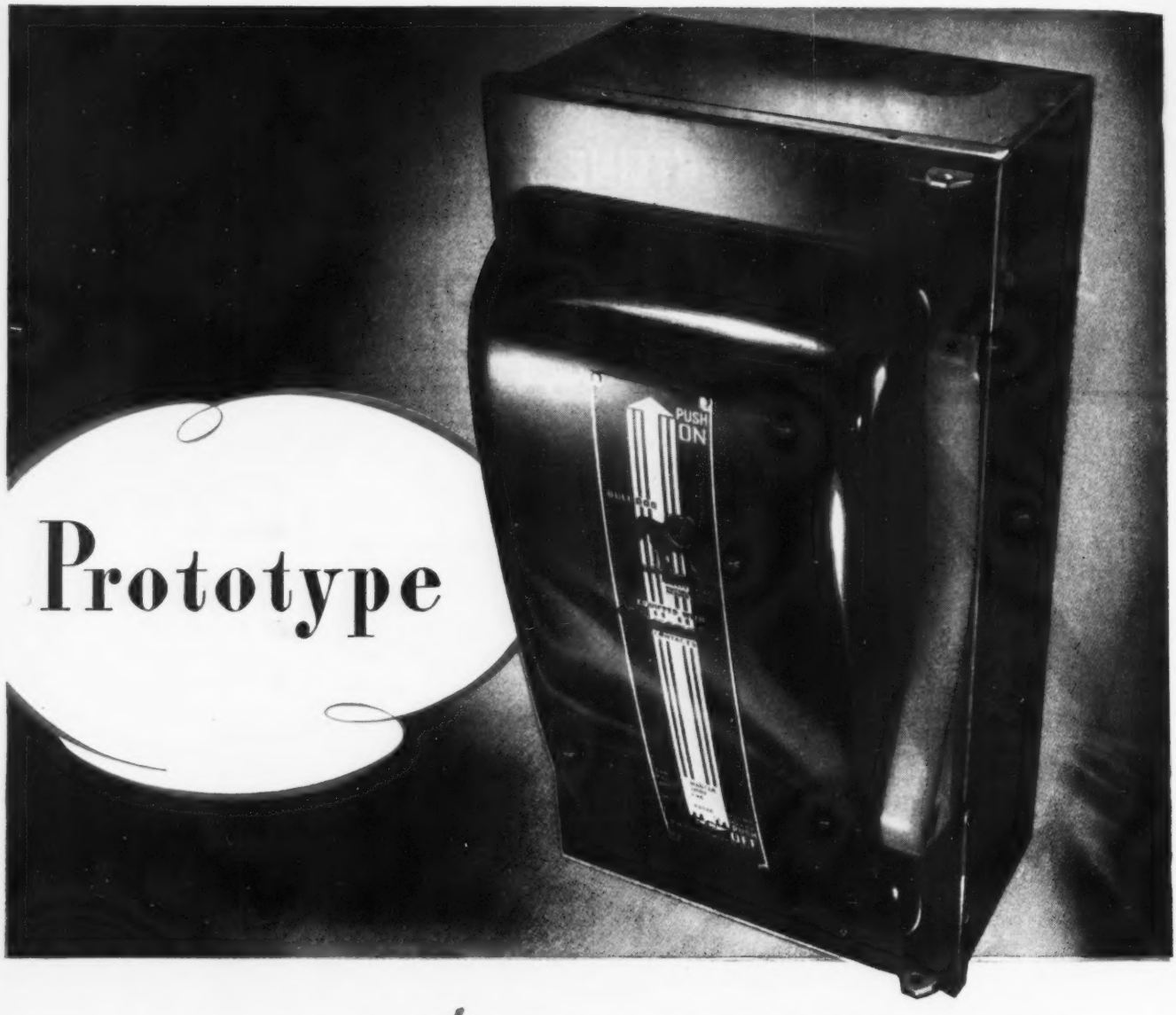
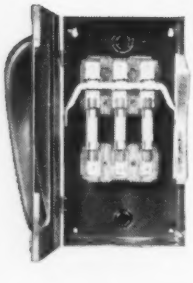
OVER 35 YEARS SERVICE TO THE UTILITIES



Prototype

Vacu-Break SAFETY SWITCH WITH "CLAMPMATIC" CONTACTS



A *Prototype,* the dictionary says, "is an original model after which anything is copied."

Measured by that definition, the BullDog Vacu-Break Safety Switch, with its many advanced features, is definitely the *prototype* of tomorrow's designs.

The exclusive Vacu-Break principle of arc suffocation—the Clampmatic feature which assures contacts tight as a bolted connection—new, simplified operating mechanism—modern streamlined design and attractive appearance—are but a few of tomorrow's safety switch features which are exclusive in the BullDog Vacu-Break Switches of today.

These *prototype* BullDog features are your guarantee against obsolescence, as well as your assurance of top performance at minimum cost right now!

Capacities from 30 Amp. to 1200 Amp. Write for illustrated folder.

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BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

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1720 N.E. Sixth Avenue
Portland, Oregon, Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224

● ROY WILKINS has joined the staff of engineering consultants of the Bonneville Power Administration, it was announced recently by Administrator Paul J. Raver. Wilkins, who was called from retirement in 1941 to supervise emergency power plant design for the Pacific Gas and Electric Co., previously had served the PG and E for a number of years in various engineering capacities. In addition, he has been associated with General Electric Co. at Schenectady, Associated Oil Co., Bakersfield, Calif., K.P.F. Electric Co., San Francisco, and the Pacific Electric Manufacturing Co., San Francisco, where he was vice-president in charge of engineering.

● E. F. PEARSON, assistant to the vice-president and general manager of Northwestern Electric Co., Portland, has been cited for effective work as North Pacific regional coordinator for the utilities wartime aid program, in a report submitted to the War and Navy departments by D. A. Sullivan, national coordinator. Pearson, whose territory covers Oregon and Washington, is one of 18 regional coordinators in the United States. The report relates how the electrical industry "provided enough and on time", and how the output of kilowatt hours per kilowatt of capacity has been increased by nearly 50% from 1939 to 1943.

● JAY J. GOODMAN, associated with the commercial department of the Northwestern Electric Co., Portland, for the past 21 years, resigned March 1 to become assistant sales manager of Gilbert's Bros. Inc., wholesalers of electrical and hardware supplies. Goodman is a long-time member of the Electric Club of Portland, and served as its president in 1944. He is also a member of the Northwest Electric Light and Power Assn. and the Portland Home Builders Assn.

● O. A. PETERSEN has been appointed personnel manager by the B. C. Electric Railway at Vancouver. He previously was associated with Dominion Rubber Co., and for the past five years had been with Canadian Industries Ltd. During the war he was appointed consultant of industry by the Federal Department of Labor. A graduate of Syracuse and McGill Universities, Petersen will advise on personnel relations throughout the company's system.

● C. T. "TED" BAKEMAN, director of industrial development of the Puget Sound Power & Light Co. in Seattle, has been named second vice-president of the Seattle Advertising and Sales Club. Bakeman is also regional vice-president of the Illuminating Engineering Society and chairman, Northwest industrial development committee of Northwest Electric Light & Power Assn.

● ELLIS CROFF has been named general accountant and director of the bookkeeping department of Thermador Electrical Mfg. Co., at Los Angeles, succeeding J. W. Toland, resigned. Croff had been credit manager and assistant bookkeeper for Thermador for three years before going with Lumidor as auditor.

● HAROLD J. MERILEES, executive assistant in the merchandising department of the B. C. Electric Railway Co. at Vancouver, has returned to civilian work. For the past few years he has been on loan by the company to the National War Finance Committee at Vancouver, where he served as public relations representative. He will continue to handle public relations work in connection with the B. C. Electric.

● CLARENCE W. SHERMAN, personnel officer of the Puget Sound Power & Light Co., Seattle, has been named vice-president for Western Washington, of the Pacific Northwest Personnel Management Assn.

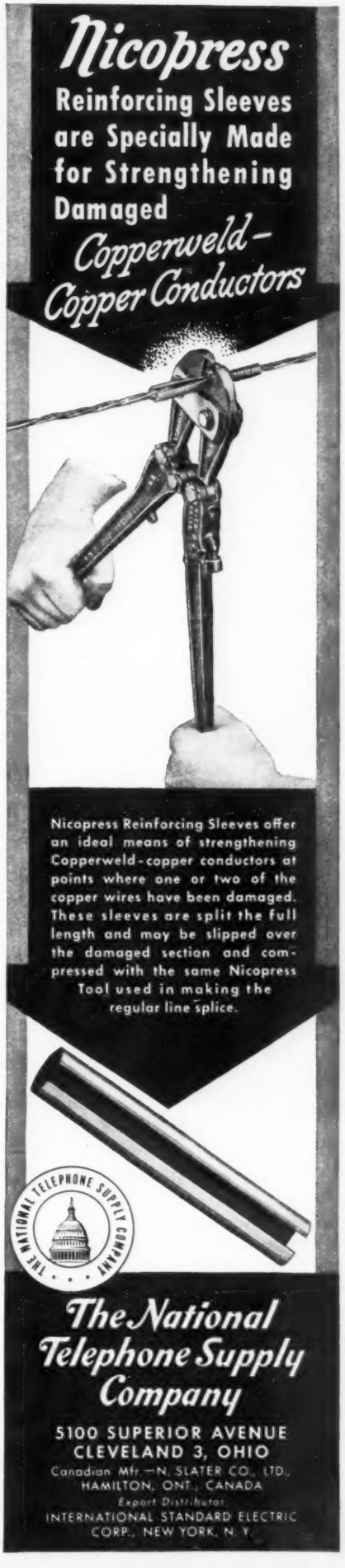
Deaths

● A SHORT ILLNESS resulted in the death of E. A. (Skipper) Bradner, Feb. 28. Well known to the electric fraternity in the Rocky Mountain area for more than a quarter-century, he had been manager of the Las Vegas Light and Power Co. since 1920. He was associated with a power company in Gray's Harbor, Wash., before going to New Mexico.

● GEORGE G. FOSTER, president of General Sales Co., San Francisco housewares distributors, died Feb. 27, aged 77, after protracted illness. Active in the San Francisco Pot and Kettle Club, he was a charter member and president in 1928; president of the Associated Pot and Kettle Clubs of America in 1932.

● B. T. MCBAIN, purchasing agent of the Portland General Electric Co., died suddenly March 2, apparently having suffered a heart attack during the night. Before joining the Portland General Electric Co. in 1930, he was engaged in the management and operation of paper and pulp mills.

● ALBERT C. HAGGENMILLER, 72, purchasing agent for the Washington Water Power Co., died in Spokane, March 15, following an illness of four months. Mr. Haggenmiller entered the employ of the company in 1907 and was made purchasing agent in 1919.


Nicopress
Reinforcing Sleeves are Specially Made for Strengthening Damaged
Copperweld–Copper Conductors
Nicopress Reinforcing Sleeves offer an ideal means of strengthening Copperweld-copper conductors at points where one or two of the copper wires have been damaged. These sleeves are split the full length and may be slipped over the damaged section and compressed with the same Nicopress Tool used in making the regular line splice.
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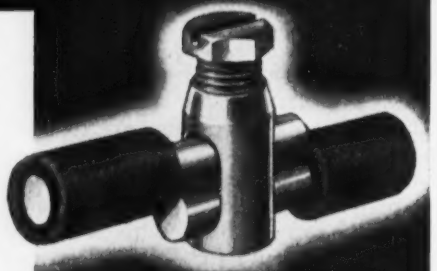
For Service Entrance Connections

We Find BLACKBURN "GRIPITS" Are the Strongest

BLACKBURN "GRIPITS" are made of DURONZE, a high-strength silicon bronze that's 75% stronger than hard-drawn copper. Circular construction gives extra strength. "GRIPITS" will not stretch or distort when tightened—will not come loose. Then, too, BLACKBURN "Gripits" are more economical for this purpose.



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Builders of Quality Connectors for Over 10 Years

ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

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Pacific Coast Representation

A firm consisting of three partners who possess extensive business and merchandising experience on the Pacific Coast, particularly in the San Francisco area, is desirous of contacting manufacturers who contemplate renewing or establishing agencies on the Pacific Coast. Satisfactory references can be furnished. Write King, Shea & Poston, 604 Mission St., San Francisco 5, California.

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THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

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Felix Simon, P.O. Box 614.....Denver
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TRADE *notes*

Industrial Pool to Seek Business for Northwest

With 13 "charter" plants, a pool of industrial groups to be known as Production Associates was formed in Seattle last month. Indications were that the Seattle alliance will be the nucleus for a Northwest organization, which will institute a united drive for business in competition with other sections of the nation and in an effort to maintain, or exceed, wartime peaks.

According to plans announced by Mark R. Colby, president of Colby Steel & Engineering Co. of Seattle, who heads the pool, the group plans to canvass the national field for large orders that can be parceled out among its members in accordance with their respective facilities and can be delivered to customers as completed units of machinery, equipment and other items, in much the same manner as is now used in subletting war contracts. He stated that the federal government has "done everything possible" in its sanction of the plan.

Other officers of the group are Wayne Haines, head of the Haines machine works, who will have charge of the Seattle office as manager-director; J. S. Criswell, who will serve as national sales representative, with offices in San Francisco, New York and Washington, D. C.; R. S. Hollister, vice-president of Ketchum Wire & Mfg. Co., vice-president; C. B. MacDougall, president, Nemco Electric, treasurer.

Also included among member companies are Seattle Lighting Fixture Co.; Eagle Brass Foundry Co., Morel Foundry, Ballard Plastics Corp. and Prescott Iron Works, all of Seattle; George R. Marvin Co., Washington Steel & Welding Co. and Heatlox Furnaces, of Tacoma; and Skagit Steel & Iron Works of Sedro Wooley.

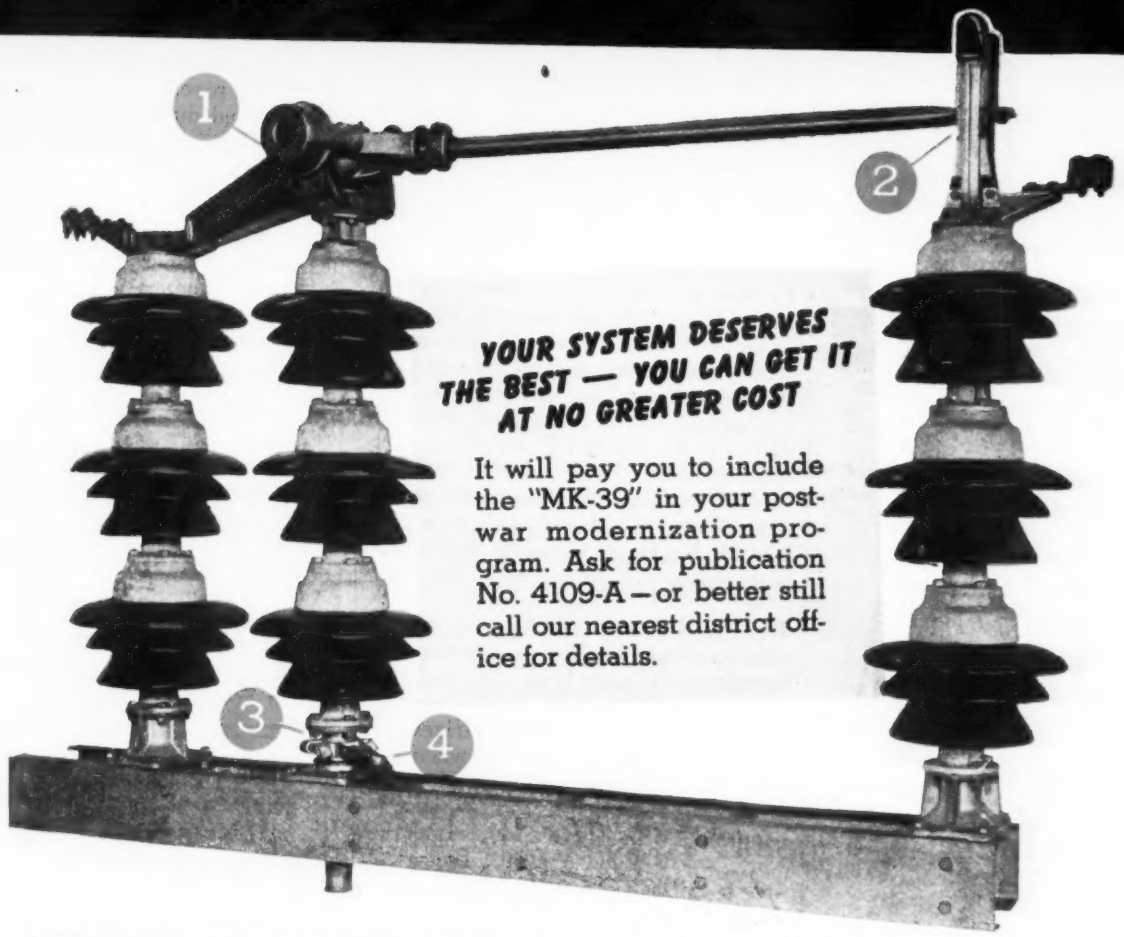
● A. B. SMEDLEY, Technical Products, has opened a new office at 15 N. Euclid Ave., Pasadena 1, Calif. Smedley is manufacturers' agent for T. J. Cope, Flexo Wire, General Luminescent, Grayhill, J-B-T Instruments, Mines Equipment, National Varnished Products, Precision Paper Tube, Revere Electric, Rollareel, Rusgreen and William E. Wright & Sons.

● PRUDENTIAL DISTRIBUTORS, INC. of Spokane has been appointed a distributor of Universal major appliances by Landers, Frary & Clark.

THE MOST DESIRABLE CHARACTERISTICS OF ALL GOOD SWITCHES ARE INHERENT IN THE "MK-39"

CONSIDER THESE FEATURES

1. Positively controlled blade motion — no stops or gadgets — fast or slow shock proof action — simplified control eliminates conventional crank arms. Blade automatically locks in both open and closed position.
2. High pressure contacts at both ends of blade — no flexible shunts and consequent corrosion troubles.
3. Greaseless non-rusting ball bearings on all essential rotating parts.
4. Operating mechanism furnished with threadless fittings equipped with self-piercing set screws, preventing slipping after final adjustments are made.



YOUR SYSTEM DESERVES THE BEST — YOU CAN GET IT AT NO GREATER COST

It will pay you to include the "MK-39" in your post-war modernization program. Ask for publication No. 4109-A — or better still call our nearest district office for details.

Available in all standard voltage ratings (thru 230-kv) and all ampere ratings (thru 6,000) for upright, inverted or vertical mounting.

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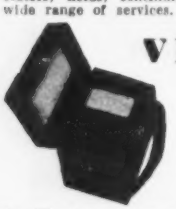
"I Find VIBROTEST the Fastest Dependable Tester" SAYS THE ELECTRICAL MAINTENANCE MAN

NO CRANKING—NO LEVELING

Instant accurate reading by open scale with VIBROTEST Insulation Resistance Tester. Compact, portable, versatile, with self-contained power source. Easily and safely operated. Checks insulation resistance of motors, stators, fields, continuity-voltage for shorts and opens-wide range of services.



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MODEL 201

0-200 megohms at 500 v. d.c. potential, 0-2000 ohms 150-300-600 v., a.c. or d.c.

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SAFE, SURE O.Z. solderless connectors

O. Z. make a complete line of Solderless Connectors. They are safe, neat, compact, and permanent; they're sure connections because they give POSITIVE contact.

O. Z. Fittings are precision connectors of high quality, and give efficient long service. They are simple to install and easily accessible for maintenance.

FITTINGS FOR EVERY PURPOSE . . . FROM ONE SUPPLY SOURCE

Write today for the new 144-page O. Z. Catalog, which illustrates, describes and gives prices on wide variety of electrical fittings.

Conduit Fittings • Cable Terminators • Junction Boxes • Solderless Connectors • Power Connectors • Grounding Devices

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JOSEPH D. SINNOTT . . . . . 1203 Western Ave., Seattle 1, Wash.

Wholesale Distributor Announces Firm Plans

Organization of the Valley Electric Co. to conduct an exclusively wholesale distribution of electrical supplies, equipment and appliances in Sacramento and Stockton, Calif., was announced recently by C. H. Carter of Sacramento, president of the C. H. Carter Co., electrical wholesale distributor in the two San Joaquin valley cities.

Eventually to succeed the Carter Co., the new firm will be directed by Carter, Earl W. Raffety, present manager of the Carter Co.'s Stockton branch, and Henry E. Jones, manager of the Sacramento branch. Associated with them in the Valley Electric Co. are Harold G. Wakefield, Frank A. Sieke, Jr., Emmett B. Winters and William J. Quinn, Jr.

● SUBSEQUENT to the last announcement of Trumbull Electric & Mfg. Co. changes in executive staff (ELECTRICAL WEST, Jan., 1945, p. 101) Carroll D. Hepler was appointed president of the Pacific division, with factories in Seattle and Los Angeles, making his headquarters in Seattle. Alfred G. von Normann, former manager of the Los Angeles plant, was elected vice-president, resident in Los Angeles. William E. Froude is secretary-treasurer. In his new position, Hepler succeeds John H. Trumbull, former governor of Connecticut, who retired as president Jan. 1. No change has been made in the organization of the Trumbull Electric Mfg. Co. Inc. at San Francisco, a separate company, where Lester Siebert, president. Charles E. Barkis, vice-president, Walter C. Hirsch, treasurer and Leo M. Kerkhoff, secretary and assistant treasurer, continue as in the past.

● JACK HARGROVE has been appointed sales manager for the distribution department of Kinney Bros., Los Angeles, which recently purchased the electric range, water heater and refrigerator patterns of Stewart Warner, when the latter was acquired by Admiral Corp. Hargrove, recently in war work, was connected with Thermador before the war.

● AFFILIATION of the Radio Television Supply Co. and the Sues-Young Co. of Los Angeles was announced recently. Under the new set-up, M. G. Sues will be president of the corporation, Mitchel Hirsh will be vice-president and E. E. Young, secretary-treasurer. The new company will be moved to quarters now occupied by the Sues-Young company at 1509 S. Figueroa St. Sues-Young now distributes Zenith Radio and major appliance lines.

● MILES STEEL, Pacific Coast Manager for Benjamin Electric Mfg. Co., has announced changes in staff representation on the Coast, following the resignation of M. L. Fowler. Fowler resigned in order to return to the San Francisco Bay Region to start a manufacturer's agency in that city. J. Hochenauer, Benjamin representative in Seattle replaces Fowler at Los Angeles and Henry R. Huber goes to Seattle. Huber, formerly with the San Joaquin Power Division of Pacific Gas and Electric Co. worked as lighting salesman and later as lighting engineer from 1929 to 1941, served with the U. S. Engineers for two and a half years and then the Berkeley Tool and Die Co. as engineer before joining the Benjamin organization.

● GOUGH INDUSTRIES INC. became the new name for Listenwalter & Gough Inc., Los Angeles manufacturer's representative, by recent action. Ownership, management, personnel and facilities are unchanged, according to the announcement, the new name being adopted to cover the many new departments added during 32 years of business. Philip Gough is president.

● OHIO BRASS CO. has announced a new location for its San Francisco office at 1503 Hobart Bldg., 582 Market St. A. M. Bohnert is manager of the office.

ELECTRICAL SALES ENGINEER

Position Open

Sales Engineer for nationally advertised electrical insulations. Territory—Northern California. Good Salary—Excellent Future. Write or apply by letter to Box 100, Electrical West, 68 Post St., San Francisco 4, Calif.

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SWITCHES, ENCLOSURES, ACCESSORIES

METER DEVICES COMPANY CANTON, O.

Questions and Answers ON THE SUBJECT OF

C-D CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

We submit some more questions that have been asked of us regarding Capacitors for power-factor improvement. To the experienced engineer, some of them may sound fairly elementary. But we believe they are all questions that spring to mind when an executive is planning an investment in power-factor equipment.

Question: *What about maintenance on power-factor improvement capacitor installations?*

Answer: Practically no maintenance is required. Our records indicate that installations put in as much as ten and fifteen years ago are still operating efficiently.

Question: *Do capacitors use critical materials?*

Answer: The use of critical materials in a capacitor installation — in comparison to other types of corrective equipment is insignificant. Hence, C-D can supply capacitors to you quickly and as you want them.

Question: *Suppose there are occasional conditions of leading power-factor?*

Answer: Rarely does the fact that the power-factor is leading cause difficulty. However, the voltage rise caused by the application of the capacitor may become excessive, somewhere around 100% power factor and it may be necessary to switch part of the capacitor equipment off.

Question: *Are capacitors a good investment?*

Answer: Yes, they are a good investment because they will alleviate a critical power shortage in your plant at the present time and save the need of purchasing new transformers and new wiring which involve much more critical material. Also, you may realize a reduction in power costs from your improved power-factor.

Question: *What is Dykanol?*

Answer: Dykanol is the impregnant used in C-D capacitors for power-factor improvement. It is a non-inflammable, non-explosive synthetic impregnant of unusually high insulation resistance, high dielectric constant, high voltage breakdown, low power-factor and extremely high chemical stability under all operating conditions.

Question: *When can I get more information on Power-Factor equipment?*

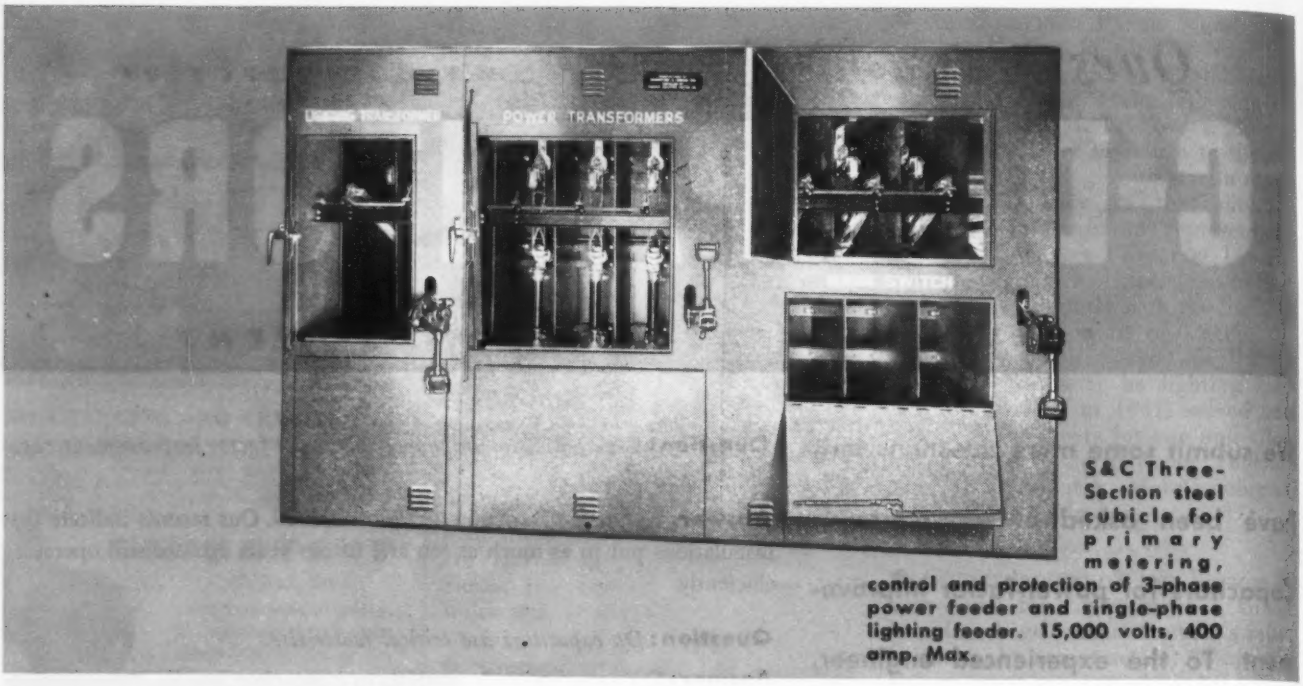
Answer: A C-D Power Factor engineer will be glad to cooperate with you, and, remember: only C-D capacitors are backed by the experience gained thru thirty-five years of capacitor specialization. Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.

180 KVA
2400 Volts
3 Phase
60 Cycle

World's Largest Manufacturer of Capacitors—1910-1945

CORNELL-DUBILIER CAPACITORS

Cornell Dubilier Capacitors



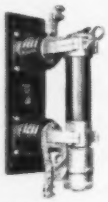
S&C Three-Section steel cubicle for primary metering, control and protection of 3-phase power feeder and single-phase lighting feeder. 15,000 volts, 400 amp. Max.

Breaks Load Without Arcing at Main Switch Contacts

S&C Load-Interrupter Disconnects

7.5—15 kv . . . 400 AMP.

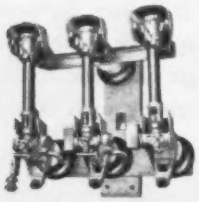
For loop sectionalizing, isolating transformers . . . feeders, disconnecting capacitors. Combined with Fuses, for substation protection and switching . . . *Bulletin 202-A*



S&C "SM" Power Fuses

7.5—34.5 kv, 400/250E Max. Amp.

High interrupting capacity makes them suitable for wide range of applications, providing safe protection on many installations where larger and costlier circuit-interrupting equipment was formerly thought necessary. *Bulletin 200E*



"Semafor" Open Cutouts&Reclosers

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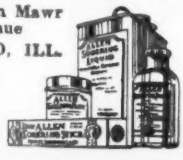

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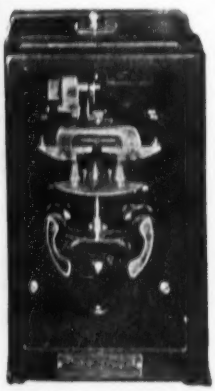

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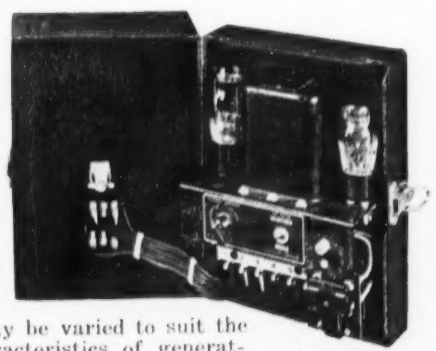

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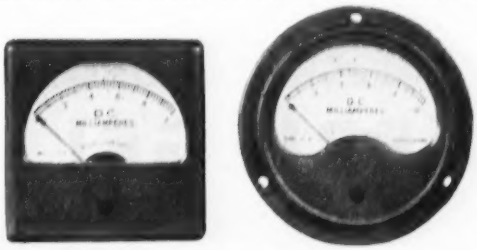

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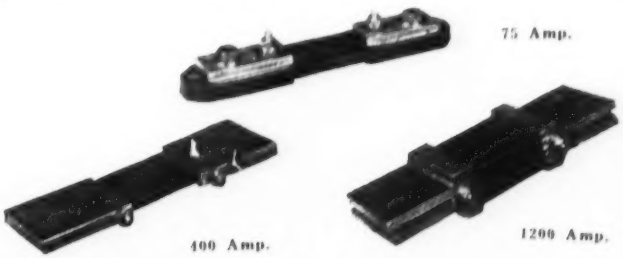

75 Amp.

400 Amp.

1200 Amp.

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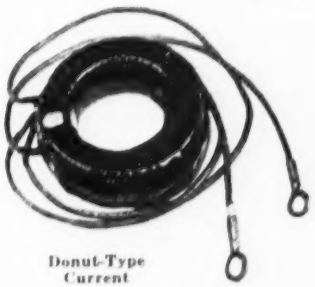
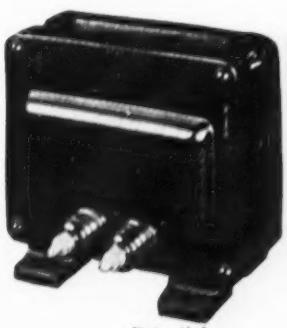
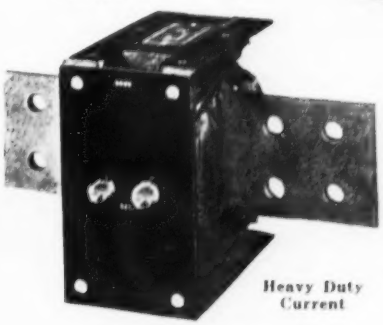


Donut-Type Current



Potential



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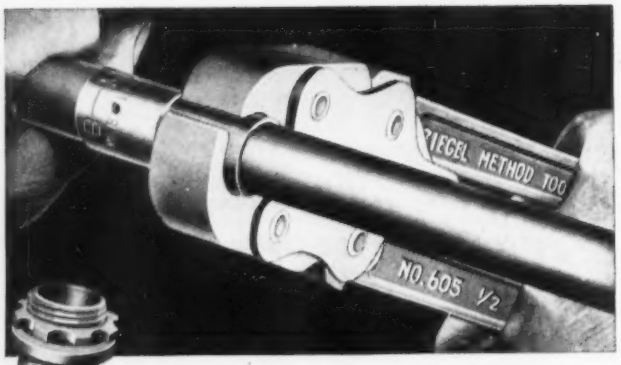

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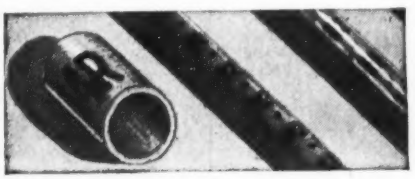

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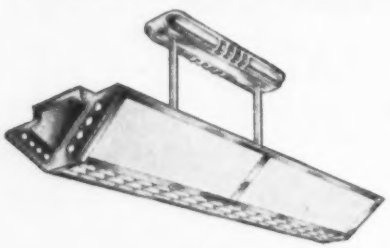

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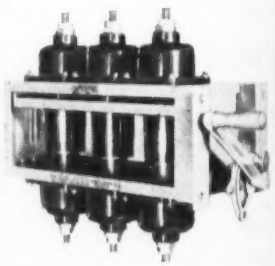

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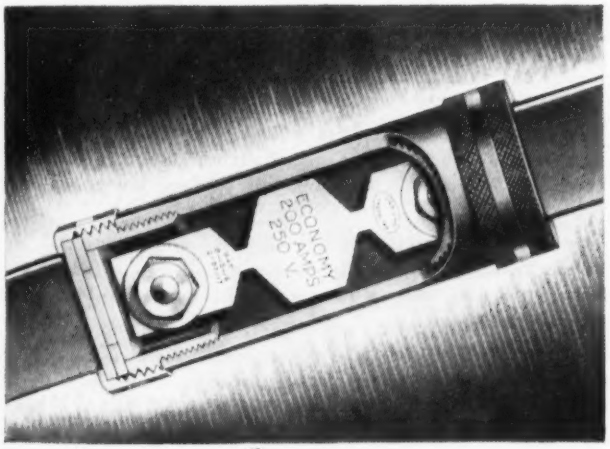

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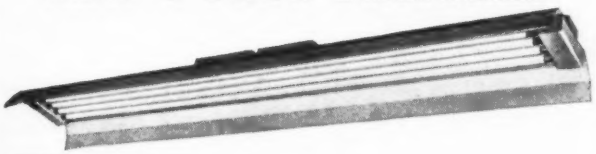

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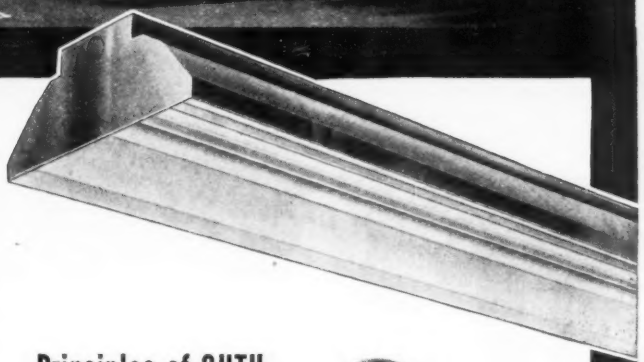

INSTALLATION DATA

One hundred and sixty GUTH FLU-O-FLECTORS, each with four 40-watt white fluorescent lamps, are installed to illuminate this area—120′ wide by 200′ long (10 bays at 20′). FLU-O-FLECTORS are mounted along the roof trusses on 6′ centers—therefore spacing is 6′ x 20′. The mounting height is 22′ 3″ above the floor. 20 to 25 Foot-Candles of light is delivered at the working plane. This means only 0.75 watts-per-square-foot for 20-25 Foot-Candles (in service) on 22′ mounting!

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Outer housing of heavy-gauge steel with welded-on closed End-Plates, is finished "300° Gray." Inner reflector is of #1 Reflector-Sheet Aluminum, processed ALZAK* for guaranteed efficiency and permanency. Reflectors are removable for easy cleaning. FLU-O-FLECTORS are available with Conventional or QUICK-LITER accessories. FLU-O-FLECTORS can be mounted as individual units, or butted end-to-end; can be installed on conduit, or with chain hangers.

** T.M. Reg. Alum. Co. of America, Pittsburgh, Pa.*
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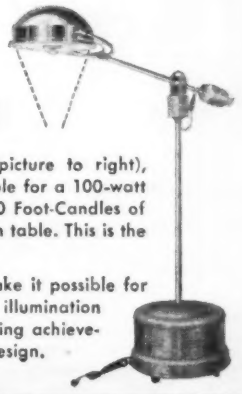
Principles of GUTH Surgical Fixture Applied to Fluorescent



In the GUTH Surgical Fixture (picture to right), engineered design makes it possible for a 100-watt Incandescent lamp to deliver 1000 Foot-Candles of illumination on the operating-room table. This is the result of scientific light-control.

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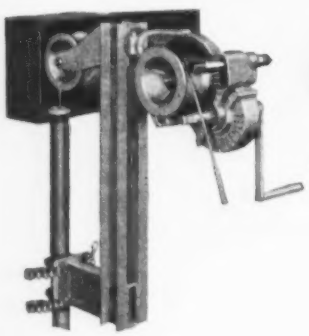

Cable Puller

To the left is the Greenlee Cable Puller set up for pulling into a box from a vertical section of conduit. Can be used in any position, is easy to take to the job, and easy to set up and operate. Ask for Cable Puller circular.

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Greenlee Knockout Tools will enlarge holes in steel panels and boxes up to ⅛" thick, quickly and accurately, without reaming or filing. Punches are made for conduit from ½" to 3", and the cutter for conduit from 1½" to 3". Ask for circular on these timesavers.

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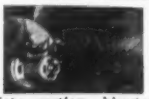

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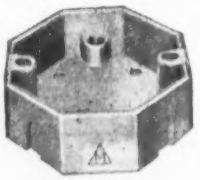

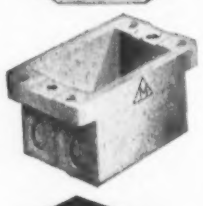

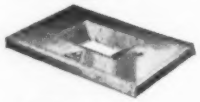

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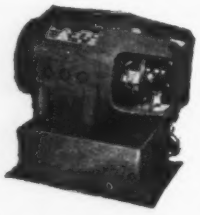

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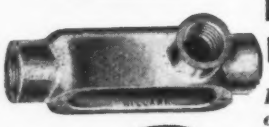

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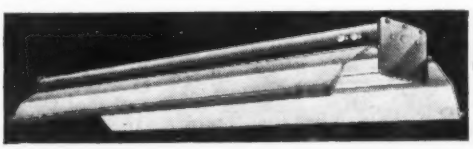

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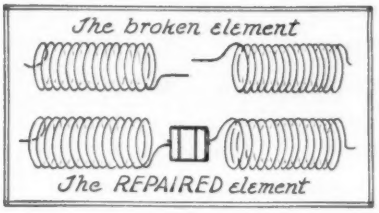

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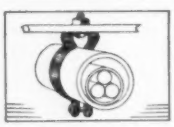

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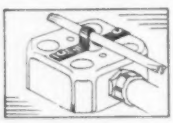

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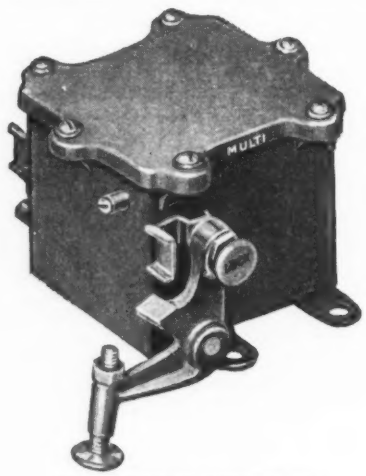

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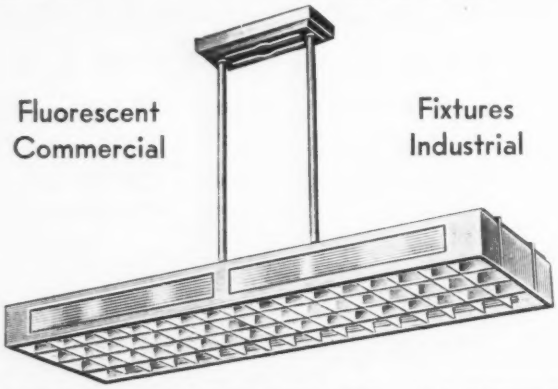

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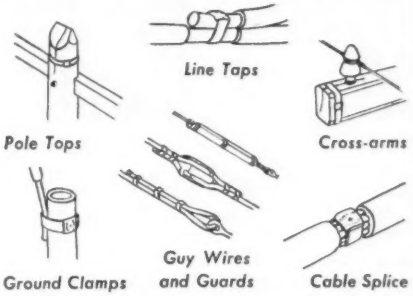

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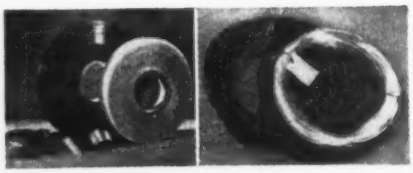

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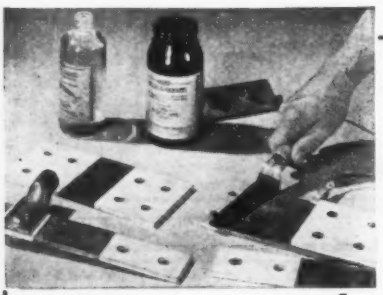

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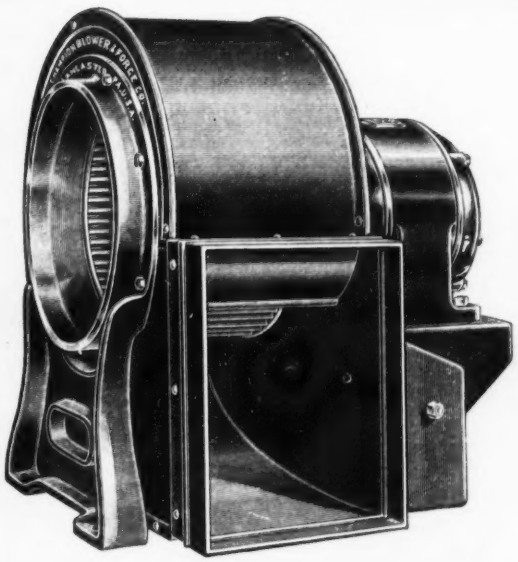

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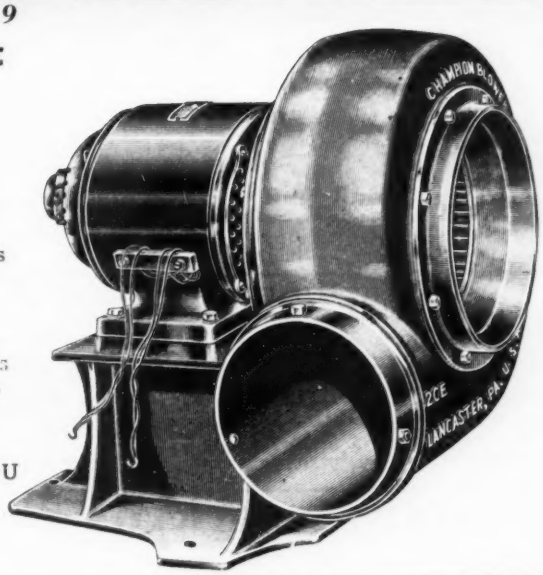

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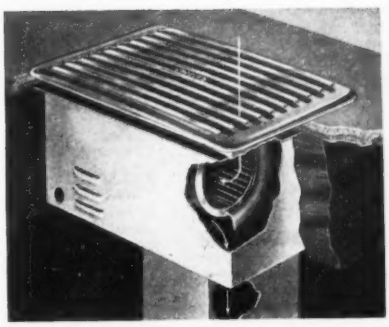

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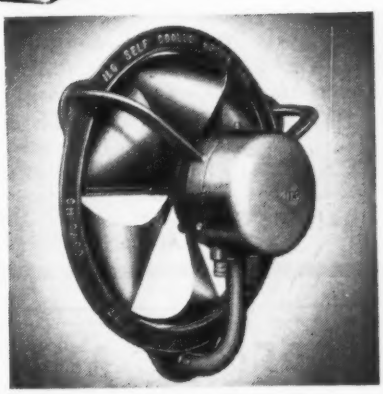

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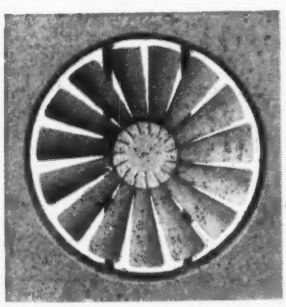

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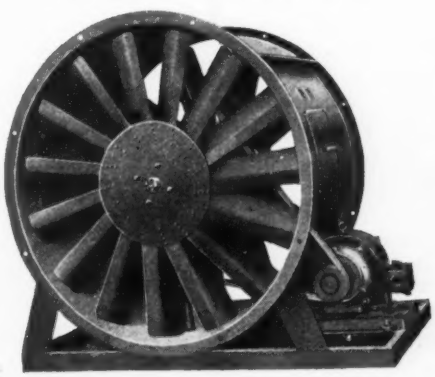

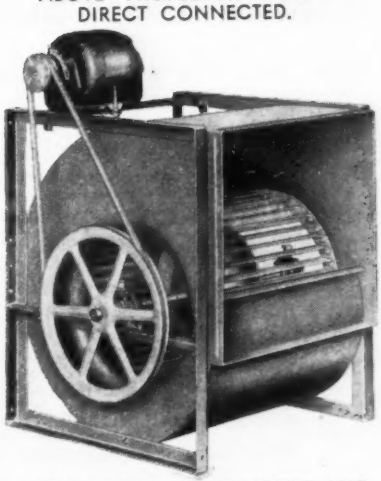

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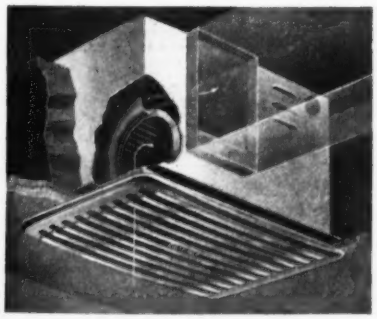

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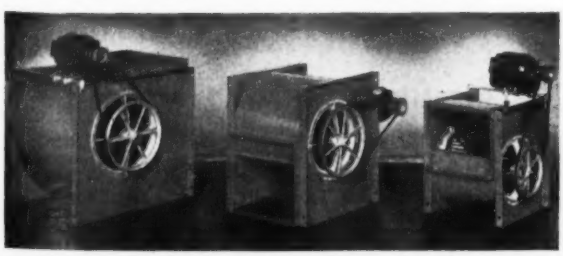

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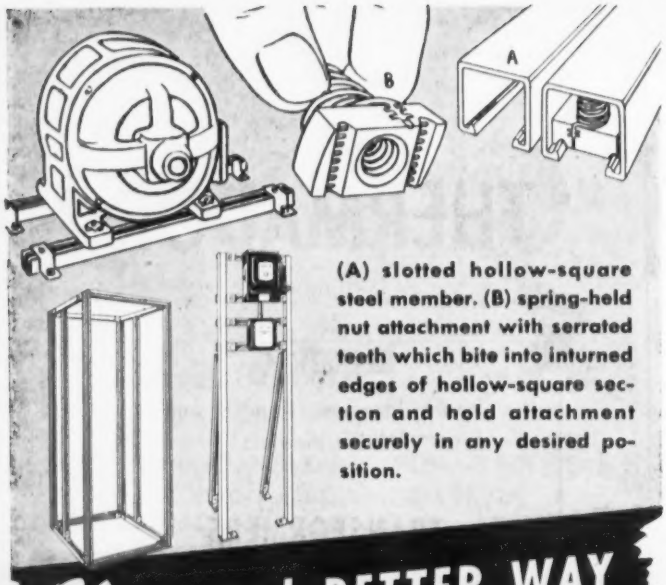

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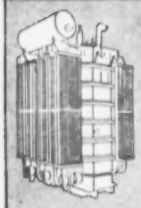

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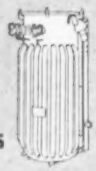

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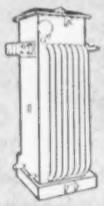

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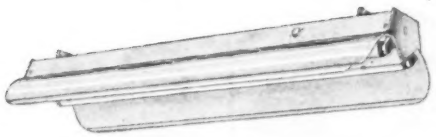

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April, 1945

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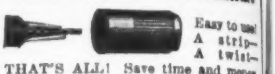
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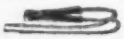

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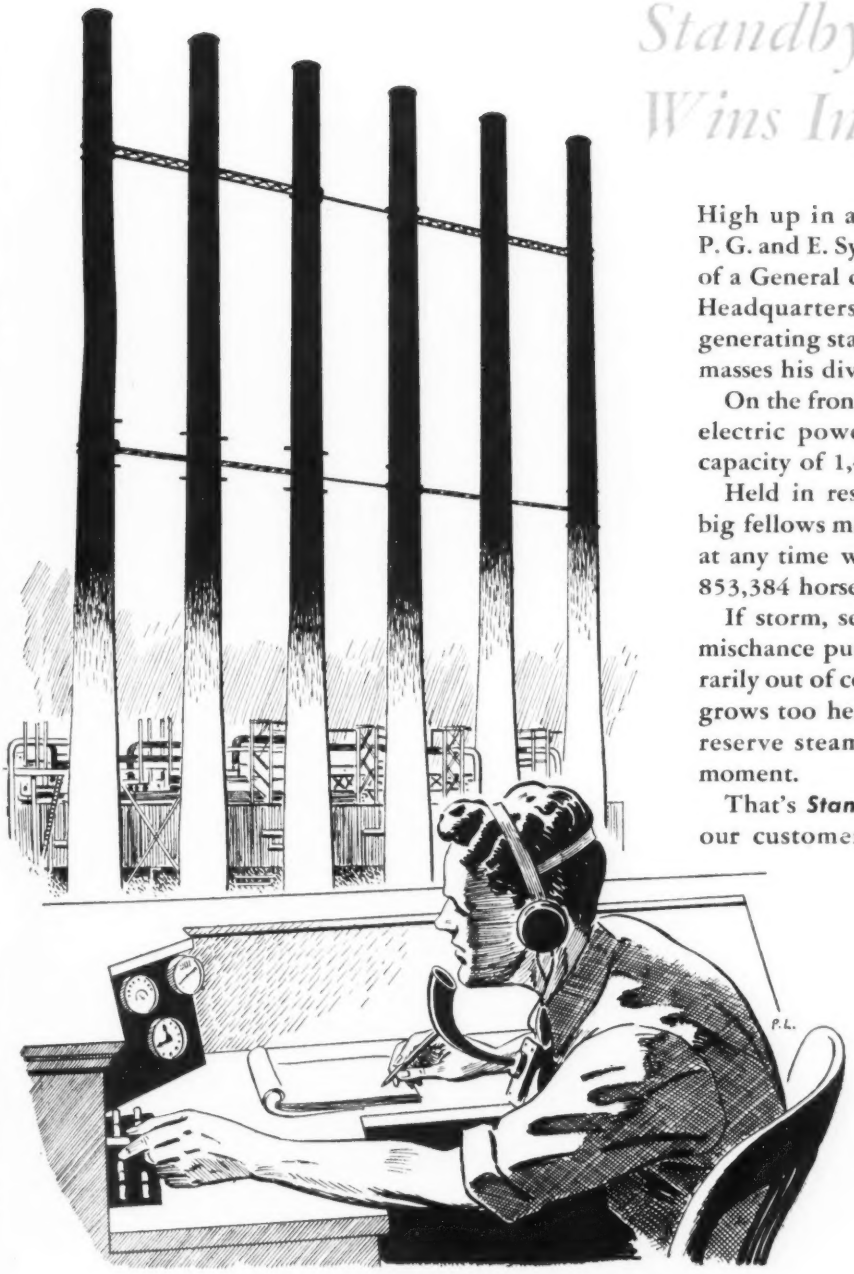

High up in an Oakland office building sits the P. G. and E. System Load Dispatcher. His role is that of a General directing operations from his Supreme Headquarters. He marshals an army of electric generating stations much as the military commander masses his divisions of men and armor.

On the front line are the 52 interconnected hydro-electric powerhouses of the system with a total capacity of 1,450,321 horsepower.

Held in reserve are 13 steam operated stations, big fellows most of them, ready to move into action at any time with additional electric forces totaling 853,384 horsepower capacity.

If storm, seasonal water shortage, or any other mischance puts one or more hydro stations temporarily out of commission or if demand at peak hours grows too heavy for the hydro plants to carry, the reserve steam plants are called up at the critical moment.

That's ***Standby,*** our insurance to Industry, to all our customers, that service everywhere shall be uninterrupted and adequate.

Standby, the reserves that frequently win the industrial fight against costly shutdowns, idle manpower and machinery.

Standby, the extra system capacity which has enabled this Company to meet every wartime demand for power. Isolated generating plants, lacking this protection, cannot equal this record.

EW 15X-445

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

An Interconnected Electric Power System Serving Central and Northern California

BUSINESS BUILDERS

P.C.E.A.

OUTSTANDING promotions selected for their general interest to the trade and their value to the ELECTRICAL INDUSTRY.

Tomorrow's Home Lighting

Thousands of home-hungry Californians are thinking *now* about their postwar living. They are dreaming of new or modernized houses, of improved lighting, of new and more appliances—all the facilities that make for better electrical living.

Evidence of the trend is found in the record of the Home Planning Institutes being held all over the State under the auspices of the State Adult Education Department with the cooperation of the P.C.E.A. and the home-building trades.

The Institute program has spread like wildfire — in fifty California cities so far and more to come. Attendance is the surprising feature — 800 to 1000 at meetings of the six Los Angeles Institutes — 800 in Sacramento. Four Institutes will be started in April in San Francisco.

The Home Planning Institute program includes courses on

Kitchen Planning
Adequate Wiring
Laundry Facilities
Home Lighting

This is a splendid opportunity to build today for the business of tomorrow.

PACIFIC COAST
ELECTRICAL ASSOCIATION
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